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R&D Funding in Atlantic Universities

November 2005

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in
Atlantic Universities

November 2005

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Maritime Provinces Higher Education Commission
82 Westmorland Street, Suite 401
P.O. Box 6000
Fredericton, NB E3B 5H1
CANADA

(506) 453-2844

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Executive Summary

R&D Funding in Atlantic Universities begins with an update of research funding statistics presented in the Commission's *Report on Post-Secondary Research Trends in Atlantic Canada* (2000) and reaches beyond these statistics by examining some of the reasons *why* Atlantic Canada faces challenges in working within the national R&D environment.

Across Canada, universities and businesses (as well as provincial governments and other R&D partners) have increased their R&D activity and used this R&D to develop products that could be sold for commercial gain. As such, the implementation of the federal government's Innovation Strategy has, to a large extent, been successful in advancing innovation. At the same time however, despite the federal government's efforts to address the people side of innovation, the Strategy itself remains heavily focussed on innovation manifested as the commercialization of R&D.

The report argues that this strong orientation of the federal Innovation Strategy can be restrictive, and not as productive as would be the case under a broader orientation, in terms of maximizing innovation across Canada's regions and in Atlantic Canada in particular. For although the drivers of innovation are theoretically the same across regions (business enterprise, higher education, federal government), the promotion and effective role of these drivers vary. The reasons for this variation lie in the fundamental differences in economic climate, university composition and supporting research infrastructure present among Canada's geographic regions.

For Atlantic Canada, this variation is important to consider as the two essential components underlying the Strategy, collaboration between public and private sectors and the commercialization of R&D, present challenges to the region. As shown in the chart below and explained in detail within the report, Atlantic Canada's R&D environment does not fit the economic model apparent in the Innovation Strategy.

Salient Features

Federal Innovation Strategy		Atlantic Canada's R&D Environment
Medical-doctoral universities	↔	Primarily undergraduate universities
R&D for commercialization; focus on natural sciences and health	↔	Link to commercialization tenuous; proportionally more R&D expenditures in the social sciences
Large R&D industries (who conduct R&D)	↔	Small to medium size industries (who conduct limited to no R&D)
R&D expenditures in private and public sectors	↔	R&D expenditures in public sector
Universities have the ability to focus more resources on R&D (more graduate programs/enrolments)	↔	Universities have limited resources for R&D (primarily undergraduate)

Nevertheless, the region does make substantial contributions to Canada's innovation environment. As shown in Chapter 1, Atlantic Canada is home to 17 of Canada's 94[1] universities. These universities educate 10% of Canada's undergraduate, and 7% of its graduate, university students.

While most regions account for a higher proportion of enrolments at the undergraduate rather than graduate level, Atlantic Canada's focus on undergraduate education stands out. In Atlantic Canada, more than 80% of universities are primarily undergraduate compared to less than half in every other region.

Distribution of Universities by Type*

	Primarily Undergraduate	Comprehensive	Medical-Doctoral
Atlantic	14 (82%)	2 (12%)	1 (6%)
QC	1 (17%)	1 (17%)	4 (67%)
ON	7 (41%)	5 (29%)	5 (29%)
West	4 (33%)	3 (25%)	5 (42%)

* Outside Atlantic Canada, only universities categorized by Maclean's magazine are included; in Atlantic Canada, five universities are added to the distribution by type. Excluding those five, the distribution in Atlantic Canada is 9 (75%), 2 (17%), 1 (8%).

The relatively small size of Atlantic Canada's universities, an attraction for some of the top students from across the country and internationally, is also one of its major handicaps in terms of securing national R&D investment. Even in Atlantic Canada's largest institutions, size still presents challenges relative to: (a) providing support for proposal development similar to that provided in larger universities, (b) enabling a critical mass of researchers and assistants to be involved in a project and (c) the capacity to house multiple research projects within the university's infrastructure. Despite these challenges, however, universities are the key sector for R&D activity in the region with this role exceeding what is expected of equivalent universities in other parts of the country.

In Chapter 2, data show that Atlantic Canada's total R&D expenditures increased 40% between 1995 and 2002. The data also show that this growth did not increase the region's proportion of the national total (down 0.5% between 1995 and 2002) and that there is considerable variation in R&D funding within the Atlantic provinces. As illustrated in the following table, gross domestic expenditures on R&D (GERD) ranged from $214 to $378 per capita in the Atlantic provinces with the strongest growth in funding having occurred in the province with the lowest per capita amount.

Per Capita Gross Dosmetic Expenditures on R&D (GERD)

	GERD ($ Per Capita*)		Growth in Per Capita Funding (%)
	1995	2002	
NS	231	378	64
NL	143	270	89
NB	151	232	54
PE	97	214	121

*Constant dollars.

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[1] Includes the Atlantic School of Theology (AST) in addition to the 93 AUCC-member universities.

When R&D expenditures are considered by sector, a clear difference emerges between Canada as a whole and Atlantic Canada. For Canada as a whole, per capita expenditures on R&D in the higher education (HERD) and business enterprise (BERD) sectors approximately doubled between 1995 and 2002. Atlantic Canada's growth in HERD per capita followed the national trend and by 2002 the region had a per capita level that compared with Canada as whole. The region's increase in BERD per capita however lagged far behind the increase noted at the national level thus widening the gap between Atlantic Canada and the rest of the country on that count.

Per Capita R&D Expenditures in the Higher Education (HERD) and Business Enterprise (BERD) Sectors

	Canada		Atlantic Canada	
	1995	2002	1995	2002
HERD	$55	$104	$47	$105
BERD	$180	$332	$38	$51

*Constant dollars.

As a result, the higher education sector remained the greatest source of R&D expenditures in Atlantic Canada. Given the region's concentration on undergraduate education and its relatively low proportion of graduate student enrolments, particularly at the doctoral level, the level of per capita R&D investment by Atlantic Canada's universities is substantial, reflecting not only the universities' commitment to R&D but also the region's heavy reliance on this sector despite its primarily undergraduate composition.

Focusing more closely on the higher education sector, Chapters 3 & 4 present an examination of federal R&D funding in universities. Data in Chapter 3 demonstrate that total granting council income increased significantly in recent years. While each granting council showed considerable growth, the MRC/CIHR increased the most, reflecting the prioritization of health research and the broader mandate of the CIHR, which replaced the MRC in 2000.

Following the national trend, Atlantic Canadian universities also more than doubled (115%) their total granting council income, thus maintaining their proportion (6%) of the national total. At the same time, the region increased its proportion of NSERC and SSHRC funding while maintaining its MRC/CIHR proportion.

Granting Council Funding in Atlantic Canada

	Granting Council Income ($ in millions*)		Proportion of Nation Total (%)	
	1997-1998	2002-2003	1997-1998	2002-2003
NSERC	21	38	7	8
SSHRC	2	7	5	7
MRC/CIHR	6	15	3	3
Total	28	61	6	6

*Constant dollars; totals may not add due to rounding.

In Chapter 4, data illustrate that implementation of the federal Innovation Strategy has resulted in an expansion of the federal research funding environment. This expansion includes increased investment into long-standing R&D programs (e.g. granting councils) as well as implementation and/or continuation of new R&D initiatives (e.g. the Canada Research Chairs program, the Canada Foundation for Innovation, the Indirect Costs program) to help researchers obtain the capital they need to get a project underway, assist institutions in supporting increased R&D and/or move a research project toward commercial application.

Several of the newest federal R&D initiatives require matching funding. This presents a significant challenge to Atlantic Canada's universities for two main reasons. First, the region's private sector, consisting primarily of small-to-medium size industries, has limited resources to devote to R&D, resulting in a limited pool of potential funding partners. Second, while elsewhere in the country provincial governments have stepped in to provide matching funds for these federal research funding initiatives, in Atlantic Canada, this type of support is relatively new and considerably limited.

Demonstration of previous granting council success, the second criterion common to most funding programs, also presents challenges in Atlantic Canada as the region's universities, of which the majority are primarily undergraduate, do not have the R&D foundation evident in larger, more research intensive universities.

Atlantic Canada, notwithstanding the challenges resulting from program design described above, has made use of several funding mechanisms launched within the federal Innovation Strategy. For example:

- In November 2004, Atlantic Canada was home to 94 (7%) of Canada's 1,348 Canada Research Chairs.
- As of April 2004, Atlantic universities received more than $80 million (4% of the national total) from the CFI, with varying levels of success within its assortment of programs. Notably, the University Research Development Fund, the program in which the region's universities were best suited to receive funding, was not available after 2001.

While increased R&D expenditure is a measure of success within the federal Innovation Strategy, this activity comes at a price as universities and other research institutions must support the indirect costs of this research. In response to concerns over these costs, the federal government committed funding designed to offset this challenge through the Indirect Costs program. Of the most recent R&D initiatives, this program appears to best take smaller universities into consideration as it provides a higher proportion of eligible costs to universities with the lowest levels of granting council funding. As of 2004–2005, Atlantic universities received more than $49 million, or 8%, of all Indirect Costs funding.

In spite of provincial differences in R&D expenditures, information in Chapter 5 suggests that each Atlantic provincial government has stepped up to the plate in terms of setting aside specific funding for PSE R&D. Using different approaches, each Atlantic provincial government provides financial assistance for university research. These sources of support include matching funding initiatives, discipline-specific funding (e.g., health-related initiatives) as well as programs designed to foster collaboration among universities and other sectors, particularly industry. However, the investment by Atlantic provincial governments is considerably lower and relatively recent in comparison to other Canadian provinces resulting in fewer R&D opportunities for Atlantic Canada's researchers. Further still, although funding for the most recent provincial government initiatives are not yet reflected in national level data, preliminary analyses suggest the region's provincial governments will face added pressure to increase investments in university R&D, particularly through matching funds for federally-based programs.

The federal government funding programs, while intended to assist universities increase their R&D capacity, appear to primarily support large universities and those with large medical schools in particular. While the most recent of the federal government's R&D initiatives show a greater consideration of the needs of smaller institutions, through measures such as special allocations within the Canada Research Chairs program and even more so the staggered funding formula of the Indirect Costs program, these efforts do not appear to fully overcome the two most prominent challenges in overall program design: the provision of matching funding and awards based on previous granting council success.

That is why, at least partially, the Atlantic Innovation Fund was created. The federal government recognized that region-specific funding was needed to assist Atlantic Canada in overcoming some of the challenges faced with respect to R&D and the commercialization of R&D. Nevertheless, the AIF program, however beneficial, does not meet the range of university funding needs in the region because: (1) its funding supply is limited and (2) its business-oriented approach to R&D is not easily applicable to university research.

It is the aim of the Commission that this report will foster a discussion of the role of universities within the context of economic development so that policy-makers and university stakeholders in general will begin to reflect upon the future of their post-secondary systems. Specific questions to this effect include how universities can maintain an effective balance of their core functions, particularly the balance between teaching and research, if expected to be *the* R&D performer for the region. This can be challenging for universities in Atlantic Canada, even medical-doctoral and comprehensive universities in the region, as they do not have access to the same level of resources found in Canada's largest universities. If universities are to be the major R&D performers in the region, and are to continue receiving limited support while doing this (as shown in Chapters 2 and 5), it is important to recognize that increased R&D activity and focus comes at a price as other university functions are likely affected.

This report suggests that collaboration between Atlantic institutions presents significant potential in building the critical mass so often lacking in smaller institutions but readily available in larger ones. With respect to the commercialization of R&D, a collaborative process has begun as the region's research commercialization network, Springboard Atlantic, involves a consortium of 14 Atlantic universities. Through the development of research networks such as this one, Atlantic universities could share both the costs and benefits of R&D thus building R&D capacity while not being stretched beyond their means.

Given the importance of university R&D and the fiscal constraints they face, provincial governments should consider establishing an on-going dialogue with their universities with a view to establishing strategic partnerships and research networks that would be beneficial not only for collaborating partners but for the region as a whole.

Furthermore, given the limited ability of the private sector to become a larger R&D contributor, at least on its own, businesses in the region would likely benefit, as the region would, from participating in collaborative R&D ventures.

Beyond the need for increased interaction among these key players, a collaborative reflection about the role universities ought to play in an economic development agenda focused on R&D, as well as about the balance that universities need to maintain between teaching and research, must be initiated. To exclude these functions from reflection on the future of R&D in the post-secondary setting may well result in the setting of objectives that put at risk the very strengths that distinguish so many of the region's universities.

Introduction

In Atlantic Canada, universities are particularly important to the economic and social fabric of the region, directly employing over 16,000 individuals (1.4% of the region's workforce)[2] and many more indirectly. Universities also contribute to the region through the development of mutually beneficial relationships with each other, their surrounding communities and across the region in general. Inherent in this is the role of universities as teaching and learning institutions whose faculty and students continually engage in the learning process so as to benefit not only the individual but also society in general as they apply their knowledge to situations that extend beyond the university campus. This acquisition and enhancement of knowledge comes not only in the form of classroom teaching and learning but also through university research. In Atlantic Canada, research and development (R&D) occurs quite differently than at the national level. While universities are substantial contributors across the country, they account for a much higher proportion of R&D activity in this region. In fact, universities could be considered *the* R&D sector in Atlantic Canada as business sector R&D, the primary source of R&D for Canada as a whole, is largely absent in this region.

Research activity, whether it be pure research, research for the purposes of commercialization, or the training of future researchers, allows for increased local and global competitiveness as new knowledge can generate new applications to old ideas or culminate in new products or services that can be transferred to the marketplace. As such, understanding a region's post-secondary research environment is important as it tells us about some of the economic potentials within that locale.

In its first report on the topic, *Report on Post-Secondary Research Trends in Atlantic Canada* (2000),[3] the Maritime Provinces Higher Education Commission (MPHEC) found that in relation to their national counterparts, university researchers in Atlantic Canada were significantly under-funded by any number of measures. In this report, we move beyond a simple update of those research funding statistics and further determine how R&D funding has evolved since the first report's release; more importantly, we examine some of the reasons *why* Atlantic Canada faces challenges in working within the national R&D environment. In addition, the report highlights some of the important contributions the region does make with respect to its post-secondary R&D community.

Although the federal government boosted investment in R&D several years prior to the 2001 Speech from the Throne, it was not until this time that the government committed to the pursuit of an Innovation Strategy that sought to place Canada among the top R&D countries in the world. In *Achieving Excellence: Investing in People, Knowledge and Opportunity* and *Knowledge Matters: Skills and Learning for Canadians*,[4] the government articulates the steps necessary to strengthen skills and learning in Canada so that all Canadians can "contribute to and benefit from the new economy." Simply put, the government places R&D at the core of its Innovation Strategy, and by doing so maintains that R&D, and the ensuing commercialization of R&D, are main drivers of the new knowledge-based economy. The government further acknowledges that to increase Canada's innovation performance by 2010 (the target year for achieving many of the goals set out in the Strategy documents), all of Canada's R&D performers and supporters must work together by building partnerships and networks that will maximize innovation.

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[2] Percentage calculated from Statistics Canada 2001 Census data (NAICS code: 6113 - educational services, university/the total labor force) for each Atlantic province (NL=3,515/241,495 or 1.5%; PE=745/73,635 or 1.0%; NS=7,895/451,375 or 1.7%; NB=4,210/371,805 or 1.1%). The Atlantic percentage (16,365/1,138,310 or 1.4%) is slightly higher than found at the national level (172,025/15,872,070 or 1.1%).

[3] And its two companion documents: *Securing our Future—A Renewal Strategy for Post-Secondary Research in Atlantic Canada* and *Post-Secondary Research in Atlantic Canada: Institutional Profiles.*

[4] Both are available at: www.innovation.ic.gc.ca/gol/innovation/site.nsf

When viewed nationally, the Innovation Strategy appears very forward-thinking. Short and longer-term goals are set (including to rank among the top five countries in the world in terms of R&D performance, to double current (2002) investments in R&D and to increase the admission of master's and PhD students by an average of five percent per year)[5] that incorporate participation and cooperation between and within both public and private sectors. Looking more closely, it is apparent that universities play a major role in this plan as they are one of the primary sources for knowledge generation and knowledge transfer across the country. At the same time, the business sector is also key as it generates and uses new knowledge, including knowledge developed within universities and other post-secondary institutions, through the processes of R&D and commercialization.

On a broad level, the data presented in this report show that the Strategy has, to a large extent, been successful in advancing innovation. Universities and businesses (as well as provincial governments and other R&D partners) have increased their R&D activity and used this R&D to develop products that could be sold for commercial gain. In addition, these partnering sectors have expanded on federal investments by developing their own strategies and mechanisms designed to increase access to the federal funding environment for research and research infrastructure.

At the same time, however, this report shows that despite the government's efforts to address the people side of innovation[6] and to meet some of the needs identified by stakeholders following release of the Strategy documents,[7] the federal Innovation Strategy itself remains heavily focused on innovation manifested as the commercialization of R&D. This strong orientation of the federal Innovation Strategy can be restrictive, and not as productive as would be the case under a broader orientation, in terms of maximizing innovation across Canada's regions, and in Atlantic Canada in particular. For although the drivers of innovation are theoretically the same across regions (business enterprise, higher education, federal government), the promotion and effective role of these drivers vary. The reasons for this variation lie in the fundamental differences in economic climate, university composition and supporting research infrastructure present among Canada's geographic regions.[8]

For Atlantic Canada, this variation is important to consider as the two essential components underlying the Strategy, collaboration between public and private sectors and the commercialization of R&D, present challenges to the region. As shown in the chart below, and explained in detail within the report, Atlantic Canada's R&D environment does not fit the economic model apparent in the Innovation Strategy.

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[5] A complete list of these targets is also available on the innovation website.

[6] *Knowledge Matters* outlines several goals and targets to increase the proportion of Canada's workforce with post-secondary education. These goals and targets are presented within four strategic areas: children and youth, post-secondary education, adult labor force and immigration, all of which call for continued collaboration among federal, provincial and territorial governments in strengthening Canada's workforce. Within this document several federal and federal-provincial-territorial initiatives are highlighted as having an impact on post-secondary education, including changes to the Canada Study Grant and an extension of the education tax credit. Further to this, several budget announcements since the release of that document also support increased access to post-secondary education through actions such as amendments to the Canada Student Loans program, introduction of the Canada Learning Bond and adjustments to the Canada Education Savings Grant.

[7] For example, changing Indirect Costs funding from a one-time investment to an annual funding program, further increasing granting council budgets and allowing more flexibility within the Canada Research Chairs program.

[8] The same could also be said of its provinces and territories.

Salient Features

Federal Innovation Strategy		Atlantic Canada's R&D Environment
Medical-doctoral universities	↔	Primarily undergraduate universities
R&D for commercialization; focus on natural sciences and health	↔	Link to commercialization tenuous; proportionally more R&D expenditures in the social sciences
Large R&D industries (who conduct R&D)	↔	Small to medium size industries (who conduct limited to no R&D)
R&D expenditures in private and public sectors	↔	R&D expenditures in public sector
Universities have the ability to focus more resources on R&D (more graduate programs/enrolments)	↔	Universities have limited resources for R&D (primarily undergraduate)

Nevertheless, the region does make substantial contributions to Canada's innovation environment—some of these occur within the current approach to R&D (for commercialization) while others occur outside the realm of commercialization.

This report finds that the higher education sector continues to be the primary source for R&D in Atlantic Canada. Undoubtedly, as shown in the body of the report, Atlantic Canada contributes to Canada's innovation capacity through collaborations on research projects, employment of some of the best and brightest researchers in their fields, and development of province-specific funding mechanisms to increase R&D and help researchers access federal research funding. Atlantic Canada has also demonstrated a commitment to advancing innovation by maintaining its overall proportion of granting council funding, and increasing proportions for two of the three councils, when significant increases to granting council budgets could have resulted in proportional shifts due to the region's primarily undergraduate university system.

This report begins where the Commission's August 2000 *Report on Post-Secondary Research Trends in Atlantic Canada* left off, by revisiting many of the statistics presented in the last report to determine how things have progressed since that time. Given the developments resulting from the federal Innovation Strategy, this report also expands upon a simple update of statistics and examines the evolution of the federal research funding environment and explains how Atlantic Canada, and more specifically Atlantic Canada's universities, fit within this evolution.

For the most part, analyses are presented from a regional perspective with provincial-level data provided for the Atlantic provinces so that comparisons can be made within the region. While institutional-level analyses would provide a broader understanding of Atlantic Canada's R&D funding trends, this level of detail is beyond the scope of this project. However, Appendix B does provide readers with a view of post-secondary research funding trends, between 1997–1998 and 2002–2003, in each Atlantic province and university for several of the most salient research funding sources (each of the granting councils, Canada Foundation for Innovation, the Canada Research Chairs Program and provincial governments).

The report begins with an overview of Atlantic Canada's post-secondary environment in relation to the rest of Canada (Chapter 1) and provides the backdrop for understanding the research funding trends reported in later chapters. Statistics are presented for university distributions across Canada, the types of universities found in each region as well as full-time faculty and university enrolment distributions, and highlights where Atlantic Canada is the same or different from its national counterparts. This chapter, as do all chapters in the report, also provides information on each of the Atlantic provinces so that individual provinces can be situated within the Atlantic context.

Chapter 2 moves into the analysis of research funding trends by first looking at Canada's R&D expenditures within the international context. It then moves to an analysis of many of the research funding statistics presented in the Commission's 2000 *Report on Post-Secondary Research Trends*, including R&D expenditures by sector, per capita, and within the higher education sector, showing the evolution of funding between 1996 and 2002.[9]

In Chapter 3, the report turns to federal government funding of university research through an analysis of the federal research funding environment and specifically, funding provided to universities through the three granting councils: Natural Sciences and Engineering Research Council (NSERC), the Social Sciences and Humanities Research Council (SSHRC) and the Medical Research Council (MRC) or Canadian Institutes for Health Research (CIHR).[10]

Chapter 4 builds on the federal research funding analyses by focusing directly on three of the government's newest research initiatives: the Canada Research Chairs Program (CRCP), the Canada Foundation for Innovation (CFI) and the Indirect Costs Program. Given the relatively new status of these programs, the chapter explores each program in detail by first describing each program and then examining data through several analytical perspectives.

Chapter 5 examines Atlantic Canada's regional funding initiative (the Atlantic Innovation Fund) as well as the provincial R&D strategies and funding mechanisms that have developed in Atlantic Canada since the release of the 2000 report. It also situates this provincial government investment within the national context.

Finally, Chapter 6 builds on the findings of the previous chapters by reflecting on data provided so as to encourage critical reflection on the role of the region's universities.

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[9] 1996 is used where it was the latest data available in the previous report; where another year was given in the 2000 Report, that year is presented. For provincial comparisons, 2002 data are the latest available; however, national level data are available up to 2004. In this case, 2004 data are presented (e.g., data on Canada's R&D expenditures, as a total, are provided up to 2004—see Figure 2.2).

[10] The CIHR replaced and expanded upon the work of the MRC; however, given the historical nature of the data presented, data for both councils are included in this report as each was active at some point during the reference period.

Chapter 1—*Understanding Higher Education* in *Atlantic Canada*

key findings

- Atlantic Canada is home to 17 (18%) of Canada's 94 universities.[11] The Atlantic region educates 10% (85,010/884,560) of Canada's university students; proportionately more undergraduate (10% or 67,190/687,510) than graduate (7% or 8,380/126,890) students study in Atlantic Canada; distributions by discipline are similar across regions. At the graduate level, Atlantic Canada educates a higher proportion of Canada's master's (8% or 6.615/78,025) than doctorate (4% or 990/27,340) level students.

- More than 80% of Atlantic universities are primarily undergraduate compared to less than half in every other region.

Distribution of Universities by Type*

	Primarily Undergraduate	Comprehensive	Medical-Doctoral
Atlantic	14 (82%)	2 (12%)	1 (6%)
QC	1 (17%)	1 (17%)	4 (67%)
ON	7 (41%)	5 (29%)	5 (29%)
West	4 (33%)	3 (25%)	5 (42%)

* Outside Atlantic Canada, only universities categorized by Maclean's magazine are included; in Atlantic Canada, five universities are added to the distribution by type. Excluding those five, the distribution in Atlantic is 9 (75%), 2 (17%), 1 (8%).

- Twelve percent (4,232/36,053) of Canadian faculty are employed in Atlantic Canada; distributions by discipline are similar across regions.

- The relatively small size of Atlantic Canada's universities, an enticement for some of the top students from across the country and internationally, is also one of its major handicaps in terms of attracting national R&D investment. Even in Atlantic Canada's largest institutions, size still presents challenges relative to: (a) providing support for proposal development similar to that provided in larger universities, (b) enabling a critical mass of researchers and assistants to be involved in a project and (c) the capacity to house multiple research projects within the university's infrastructure.

- Universities are the key sector for R&D activity in the region ranging from stages of conception through to commercialization. This role exceeds what is expected of equivalent universities in other parts of the country that have easier access to other forms of research infrastructure including materials, personnel and investments.

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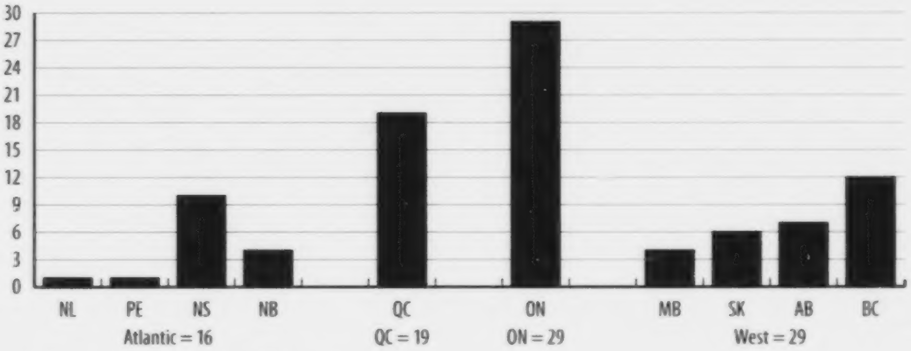
[11] Includes the Atlantic School of Theology (AST) in addition to the 93 universities listed in the 2004 *Directory of Canadian Universities* released by the Association of Universities and Colleges of Canada.

1.1 Universities in Canada and Atlantic Canada

Although there are other R&D performers in Canada, the post-secondary[12] sector remains pivotal—and one of Canada's greatest sources of strength—as an international R&D competitor. Within Canada itself, the Atlantic provinces are even more reliant on this sector for R&D than other regions for reasons detailed in Chapter 2. However, prior to examining R&D activity and funding of R&D in the region, it is crucial to first understand the region's post-secondary environment within the national context.

According to the Association of Universities and Colleges of Canada (AUCC) 2004 *Directory of Canadian Universities*, there are 93 public degree-granting universities[13] across Canada. As illustrated in Figure 1.1, the majority of these universities are situated in Ontario (29) and Québec (19) with a significant proportion found on both the east (16) and west (29) coasts. In Atlantic Canada, there are 16 AUCC-member universities[14] which account for 17% (16/93) of the Canadian total.

Figure 1.1
AUCC Universities by Province and Region



Source: Association of Universities and Colleges of Canada (AUCC).

These Atlantic universities, in addition to the Atlantic School of Theology which is not included in the total above, make important contributions to the nation's post-secondary system. The structure of the Atlantic PSE system, and the nature of its contributions, however, are quite different from that found elsewhere in the country. For example, of those ranked nationally (Maclean's definitions described in section 1.2), Atlantic Canada represents approximately 26% (12/47) of the nation's universities, with three-quarters of these considered primarily undergraduate institutions (9/12).[15] This is quite different from other regions where primarily undergraduate universities account for less than one-half, to just one-fifth, of the universities included for each region (as shown later in Figure 1.2). In addition, all of Atlantic Canada's universities, even its single medical-doctoral and its two comprehensive universities[16] are among the smallest in size of their kind in the country. This presents challenges in terms of economies of scale, notwithstanding the presence in the Maritimes of the Maritime Provinces Higher Education Commission (MPHEC) as the only cross-institutional coordinating and collaborative vehicle of its kind in the country.[17] Finally, the fact that Atlantic Canada has a faculty (12%) and student enrolment (10%) proportion higher than predicted from its population (7%) figures presents economic benefits but it also puts a disproportionate burden on provincial funding capacity.

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[12] The terms post-secondary education and higher education are used interchangeably throughout the report.

[13] A list of these universities is available in Appendix A: Methodologies.

[14] Under the MPHEC mandate there is one other university in the Maritime provinces, the Atlantic School of Theology (AST), which is not a member of the AUCC.

[15] Notably, five of the region's universities are not included in the Maclean's rankings; these institutions are added to analyses, as discussed in section 1.2.

[16] Memorial University of Newfoundland (MUN) is considered a comprehensive university by Maclean's magazine although it does have a medical school—see section 1.2.

Table 1.1 below illustrates the composition of Atlantic Canadian universities.

Table 1.1
Atlantic Canada's Universities

Institution	Province	University Type	Full-time Faculty (2003-2004)	Percent of Atlantic Total	Total University Enrolment (2003-2004)	Percent of Atlantic Total	Graduate Enrolment (2003-2004)	Percent of Atlantic Total
Memorial University of Newfoundland (MUN)[1]	NL	Comprehensive	839	20%	16,995	19%	1,570	16%
University of Prince Edward Island (UPEI)	PE	Primarily Undergraduate	204	5%	3,843	4%	147	1%
Acadia University (Acad)[2]	NS	Primarily Undergraduate	206	5%	4,685	5%	404	4%
Atlantic School of Theology (AST)[2,3]	NS	n/a	6	<1%	119	<1%	119	1%
Cape Breton University (CBU)	NS	Primarily Undergraduate	92	2%	3,230	4%	189	2%
Dalhousie University (Dal)	NS	Medical-Doctoral	937	22%	14,976	17%	3,501	36%
Mount Saint Vincent University (MSVU)	NS	Primarily Undergraduate	138	3%	4,292	5%	936	10%
Nova Scotia Agricultural College (NSAC)	NS	n/a	61	1%	555	1%	69	1%
Nova Scotia College of Art and Design University (NSCAD)	NS	n/a	42	1%	1,041	1%	27	<1%
St. Francis Xavier University (SFXU)	NS	Primarily Undergraduate	234	6%	5,271	6%	210	2%
Saint Mary's University (SMU)	NS	Primarily Undergraduate	220	5%	8,165	9%	576	6%
Université Sainte-Anne (USA)	NS	n/a	35	1%	405	<1%	49	<1%
University of King's College (UKC)	NS	n/a	27	1%	1,037	1%	0	0%
Mount Allison University (MTA)	NB	Primarily Undergraduate	129	3%	2,496	3%	7	<1%
Université de Moncton (UdeM)[4]	NB	Primarily Undergraduate	369	9%	6,447	7%	628	6%
University of New Brunswick (UNB)[4]	NB	Comprehensive	594	14%	12,912	14%	1,370	14%
St. Thomas University (STU)	NB	Primarily Undergraduate	90	2%	3,102	3%	0	0%

[1] Enrolment data for MUN are for 2001-2002 using provincial level statistics; more recent comparable data were not available.

[2] Forty-eight students at Acadia and 52 students at the Atlantic School of Theology are included as graduate enrolments as they are enrolled in the Master of Divinity program. They are reported in the database as 1st Professional to coincide with the ordainment process.

[3] AST faculty data are for 2001-2002 as 2002-2003 data had not been confirmed within the Statistics Canada data.

[4] These universities have multiple campuses: Universite de Moncton — Moncton, Shippagan and Edmunston; University of New Brunswick — Fredericton and Saint John.

Sources: MPHEC; Statistics Canada; Maclean's; author's calculations.

Each of these universities has a unique mandate and distinctive research strengths that sets it apart from others; however, many also share similar obstacles and triumphs with respect to research and development. These 17 universities are examined in greater detail throughout the report as a regional collective, by province, by university type (medical-doctoral, comprehensive, primarily undergraduate) and, in some cases, individually. A synopsis of selected research funding trends for each university is presented in Appendix B.

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[17] As an agency of the Council of Maritime Premiers that provides advice to Ministers responsible for post-secondary education in the Maritimes, the MPHEC assists institutions and governments in enhancing a post-secondary environment that reflects the values of quality, accessibility, mobility, relevance, accountability, and scholarship and research. Refer to the MPHEC website (www.mphec.ca) for further details.

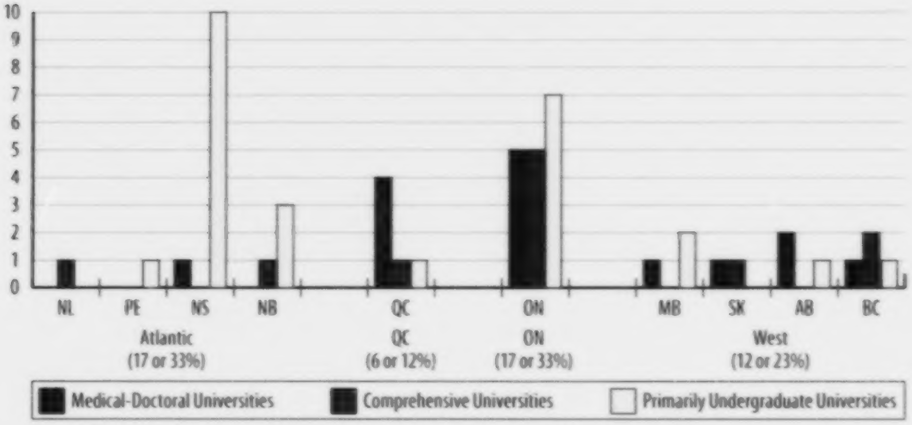
1.2 Types of Universities

Not surprisingly with 93 universities (94 if including AST), Canada has a range of university types, as alluded to in the previous section. According to Maclean's magazine, there are three categories:

(1) *Medical-Doctoral Universities* offer a broad range of PhD programs and research, as well as medical schools.
(2) *Comprehensive Universities* have a significant amount of research activity and a wide range of programs at the undergraduate and graduate levels, including professional degrees.
(3) *Primarily Undergraduate Universities* are largely focused on undergraduate education, with relatively few graduate programs.

Of the 47 universities included in the Maclean's rankings, 15 are medical-doctoral universities, 11 are comprehensive and 21, primarily undergraduate.[18] In the Atlantic provinces, 12 universities are included in these rankings and all but three are considered primarily undergraduate (Dalhousie University (Dal)=medical-doctoral; University of New Brunswick (UNB)=comprehensive; Memorial University of Newfoundland (MUN) = comprehensive).[19] For this report, five Maritime universities (Atlantic School of Theology, Nova Scotia Agricultural College, Nova Scotia College of Art and Design University, Université Sainte-Anne and University of King's College) are added to the list of universities by type, in order to provide a more complete picture of post-secondary research funding for all universities within the Atlantic provinces. Figure 1.2 shows the distribution of universities, by type, across Canada.

Figure 1.2
Distribution of Universities by Type



* Includes those universities categorized by Maclean's magazine and the five additional Maritime universities.
Source: Maclean's University Rankings 2004; author's calculations.

With the addition of the five Maritime universities, Ontario and Atlantic Canada account for the largest proportion (33% each) of Canadian universities. The West follow (23%) and then Québec (12%).[20] At the provincial level, Ontario has the highest number of universities (17) followed by Nova Scotia (11); with a smaller number of universities in each of the remaining provinces. As noted earlier in the chapter, in the Atlantic provinces all but three universities are primarily undergraduate, with UNB and MUN the only comprehensive, and Dal the only medical-doctoral, schools. In Québec, four universities are medical-doctoral, with one comprehensive and one primarily undergraduate university also included; while in Ontario, there is an equal number of medical-doctoral and comprehensive universities (5) with slightly more considered primarily undergraduate (7). Finally, each province in the West has at least one medical-doctoral school with one and two comprehensive universities in Saskatchewan and British Columbia (respectively) and at least one primarily undergraduate university in three of the four provinces in Western Canada.

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[18] Maclean's magazine "does not rank schools with fewer than 1,000 full-time students or those with a strictly religious or specialized mission." A complete list of universities included in their rankings, by category, is found under Appendix A.

[19] Notwithstanding the Maclean's categorization, MUN does have a medical school.

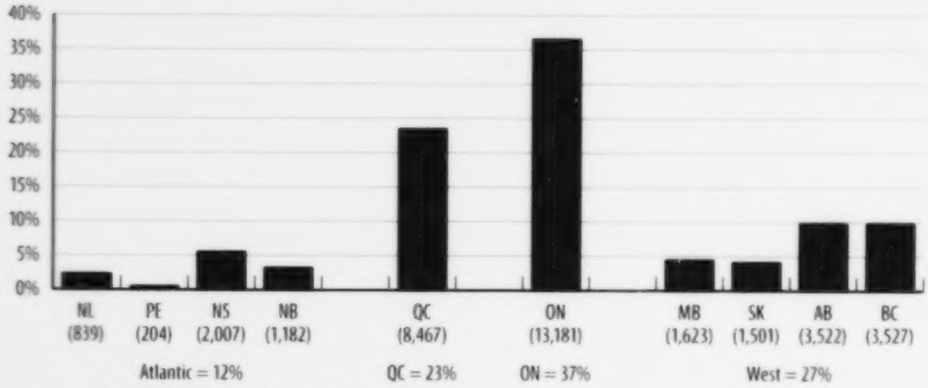
[20] The considerable discrepancy between the AUCC list and the Maclean's groupings for the province of Québec lies in the fact that the Université du Québec (and its affiliates) are not included in the Maclean's rankings.

The above figures show that while Atlantic Canada has a significant number of universities within the national total (17% of AUCC; 33% of those ranked by type), considerably more of its universities are primarily undergraduate (over 80%), more than any other region. Even when the five additional universities are removed (those that were added to obtain a more comprehensive picture of Atlantic Canada), primarily undergraduate universities still account for 75% of the region's universities, compared to less than half in every other region (ON = 41%; West = 33%; QC = 17%).

1.3 Full-time Faculty—Canada and Atlantic Canada

Canadian universities employed more than 36,000 full-time faculty in 2002–2003. Of these, 9% (3,393) were found in the Maritimes and an additional 3% in Newfoundland and Labrador (839). Ontario employed the largest proportion (37%) followed by the West (27%) then Québec (23%) (Figure 1.3).

Figure 1.3
Distribution of Full-time Faculty by Province, 2002–2003



Source: Statistics Canada; author's calculations.

Distribution of Full-time Faculty by Major Subject Taught/Discipline

Given the tendency for federal research funding to be awarded through three broad categorizations of research disciplines (in accordance with its three granting councils), it is important to examine the distribution of full-time faculty in greater detail. Figure 1.4 provides a visual representation of full-time faculty by these discipline groups: (1) natural sciences and engineering (NSE), (2) social sciences and humanities (SSH) and (3) health.[21]

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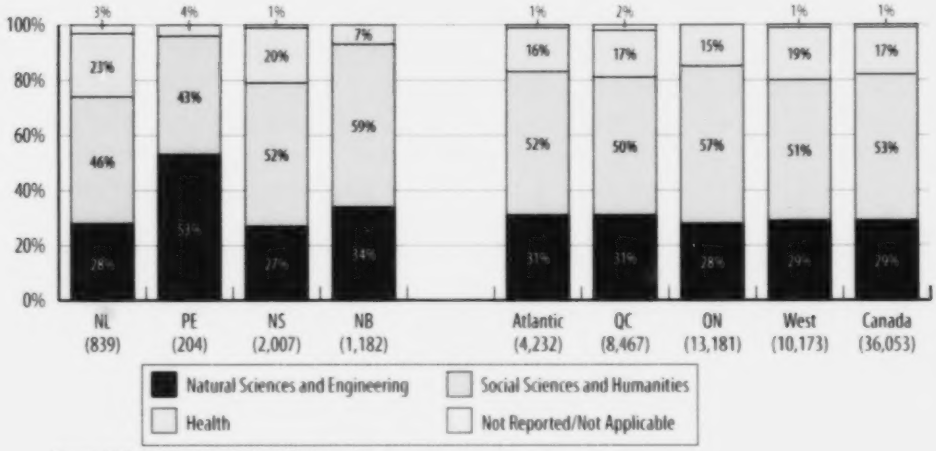
[21] A list of disciplines included in these categories is found under Appendix A.

Figure 1.4
Distribution of Full-time Faculty by Discipline Group, Region and Atlantic Province, 2002–2003



Source: Statistics Canada; author's calculations.

Interestingly, when presented as a regional collective, in 2002–2003, the distribution of Atlantic faculty was quite similar to faculty proportions elsewhere in Canada (Figure 1.4). Ontario, the only region with a considerably different distribution under any discipline, employed a greater proportion of its faculty in the social sciences and humanities (5 points greater than the next highest region, Atlantic Canada, 52%).

- In Nova Scotia as well as in Newfoundland and Labrador most faculty were found in the social sciences and humanities (NL=46%; NS=52%) followed by natural sciences and engineering (NL=28%; NS=27%) and health (NL=23%; NS=20%), demonstrating a strong presence of faculty in each discipline area.
- In Prince Edward Island, faculty in the natural sciences and engineering disciplines accounted for more than half (53%) of the province's faculty with those employed in the social sciences and humanities also accounting for a considerable proportion (43%). Faculty in the health disciplines made up just 4% of the province's full-time faculty.
- In New Brunswick, approximately two-thirds (59%) of full-time faculty were employed in the social sciences and humanities disciplines, the highest proportion of any discipline within the four Atlantic provinces. Faculty in natural sciences and engineering accounted for the majority of remaining faculty (34%) with the health disciplines employing 7% of faculty in this province.

While the social sciences and humanities disciplines accounted for more than half of Atlantic Canadian faculty in 2002–2003, Figure 1.5 shows that there were notable concentrations of natural sciences and engineering, and in one case health, faculty in several Atlantic universities.[22]

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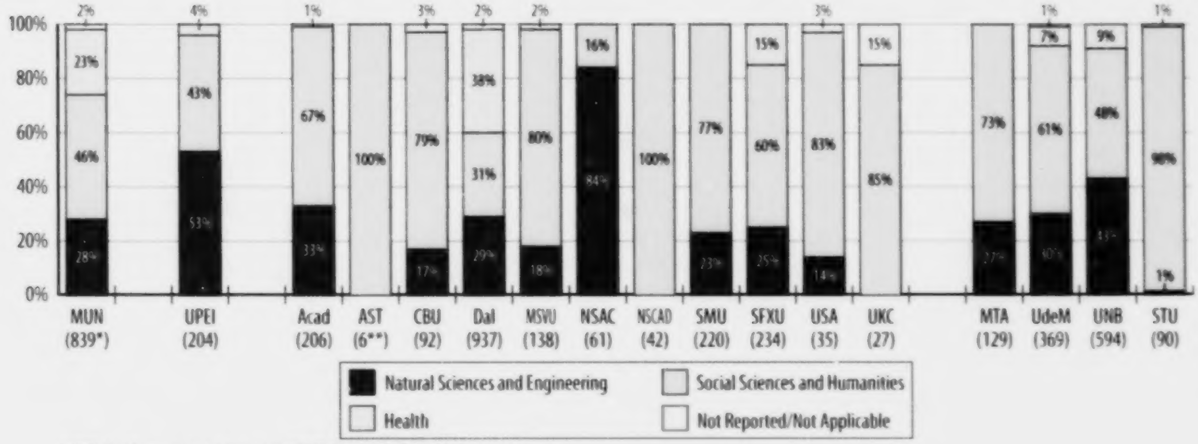
[22] Statistics for Memorial University of Newfoundland are taken from provincial data as it is the only university reported for that province.

Figure 1.5

Distribution of Full-time Faculty in Atlantic Universities by Discipline Group, 2002–2003



* MUN data from provincial reporting; **AST data are for 2001-2002.
Source: Statistics Canada; author's calculations.

At the Atlantic School of Theology (AST) and the Nova Scotia College of Art and Design University (NSCAD) all faculty were employed in the social sciences and humanities disciplines; this is not surprising given the specialized nature of these institutions. For St. Thomas University (STU) the proportion was nearly as high at 98%. The University of King's College (UKC) reported a major subject taught for just 85% of its faculty, and all were within the social sciences and humanities disciplines.

The majority of remaining universities were also particularly strong in the social sciences and humanities (Acad, CBU, MSVU, SMU, SFXU, USA, MTA, UdeM); however, they had a strong natural sciences and engineering base. In addition, for St. Francis Xavier University and the Université de Moncton, health faculty were quite evident, accounting for 15% and 7%, respectively.

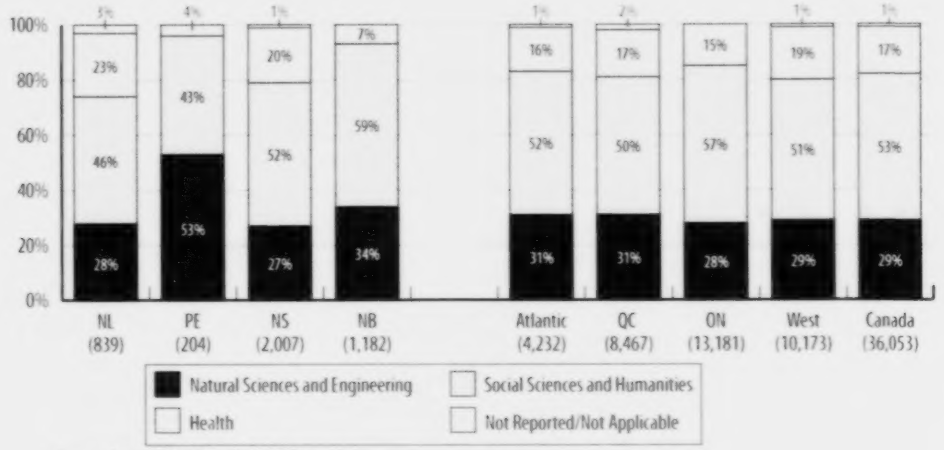
The University of Prince Edward Island and the University of New Brunswick shared closer proportions of faculty within the two major discipline groups (NSE and SSH were within 10% for both institutions) with health faculty also evident (4% and 9%, respectively).

The Nova Scotia Agricultural College (NSAC) employed its entire faculty within the two main discipline groups; however, its distributions were counter to those in most Atlantic universities as the natural sciences and engineering disciplines (84%) dominated in proportion.

Dalhousie University and Memorial University of Newfoundland, the region's largest sources of full-time faculty, employed much closer proportions of faculty in each of the three groups. Memorial University had a heavier concentration of faculty in the social sciences and humanities (46%) disciplines than Dalhousie University, with roughly equal distributions of its faculty in the natural sciences and engineering (28%) and health (23%) disciplines. Dalhousie, on the other hand, had relatively equal percentages across all three groups with health faculty accounting for the largest proportion (NSE=29%, SSH=31%, Health=38%). The higher proportion of health faculty in these institutions is understandable given that they are the only medical schools in the Atlantic provinces.

Figure 1.4

Distribution of Full-time Faculty by Discipline Group, Region and Atlantic Province, 2002–2003



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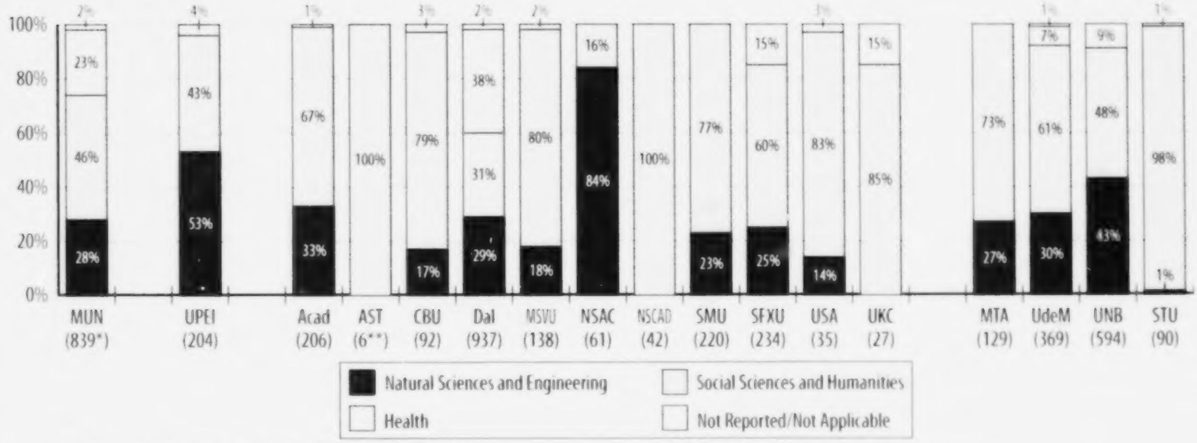

* MUN data from provincial reporting; **AST data are for 2001-2002.
Source: Statistics Canada; author's calculations.

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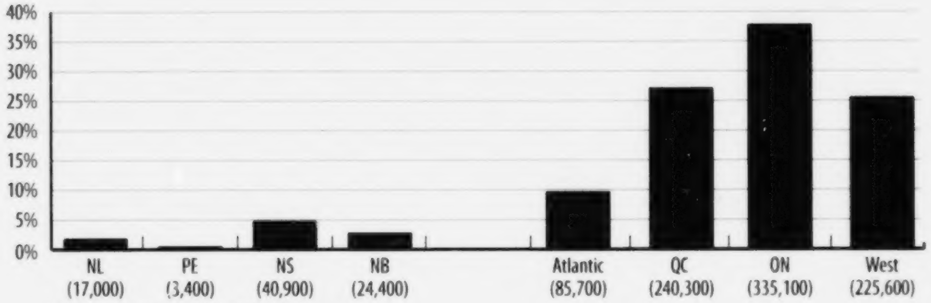
1.4 University Enrolments—Canada and Atlantic Canada

Another key component of a region's post-secondary environment is student enrolments. According to Statistics Canada, in 2001–2002 (the latest year available), enrolments at Canadian universities approached 900,000. Universities in the Maritimes accounted for almost 8% of that total (approximately 68,700) with Newfoundland and Labrador bringing Atlantic Canada's proportion to almost 10% (approximately 85,700). Figure 1.6 presents enrolment proportions for the four Atlantic provinces and by region.

Figure 1.6
University Enrolments by Region and Atlantic Province, 2001–2002



* Enrolments may not add due to rounding.
Source: Statistics Canada—The Daily, July 30, 2004.

Regionally, Ontario and Québec accounted for more than two-thirds of the country's university enrolments (38% and 27% respectively) with the West educating another one-quarter (25%). As noted earlier, the Atlantic provinces accounted for 10% of the country's university student population, a considerable share of the nation's post-secondary learners.

As expected, Nova Scotia accounted for the greatest proportion (5%), in Atlantic Canada, of total Canadian enrolments. Home to eleven of the seventeen universities located in the Atlantic region, Nova Scotia's universities educated close to 41,000 full- and part-time students. New Brunswick educated the second highest proportion (3%) followed by Newfoundland and Labrador (2%) and Prince Edward Island (<1%)—both home to just one university.

Turning to enrolments by degree level, Figures 1.7a and 1.7b show that in 2001–2002 Atlantic Canadian enrolments accounted for approximately 10% of all undergraduate, and 7% of all graduate, university student enrolments in Canada.[23] The greater presence of undergraduate enrolment is evident in three of the four regions, with Québec educating significantly more of the nation's "other undergraduate" students. This is to be expected given that, for these data, Statistics Canada placed CEGEP programs in this category.

At the graduate level, Figure 1.7b shows that Atlantic Canada accounts for proportionately more master's (8%) than doctorate (4%) level enrolments. In Québec a higher proportion of master's level studies is also evident (QC—master's=33%; doctorate=31%), while both Ontario and the West had proportionately more (ON—master's=34%; doctorate=40%) or equal (West=25% each) proportions of Canada's enrolments at the master's and doctorate levels.

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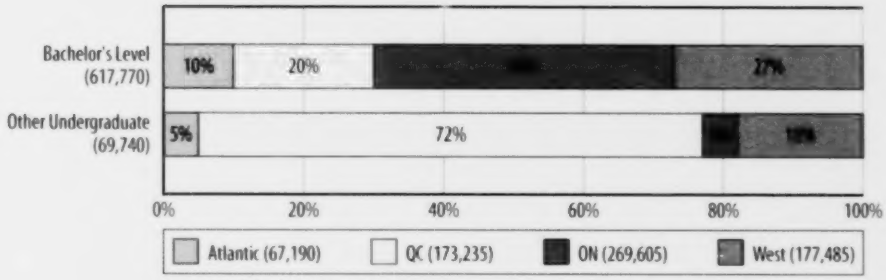
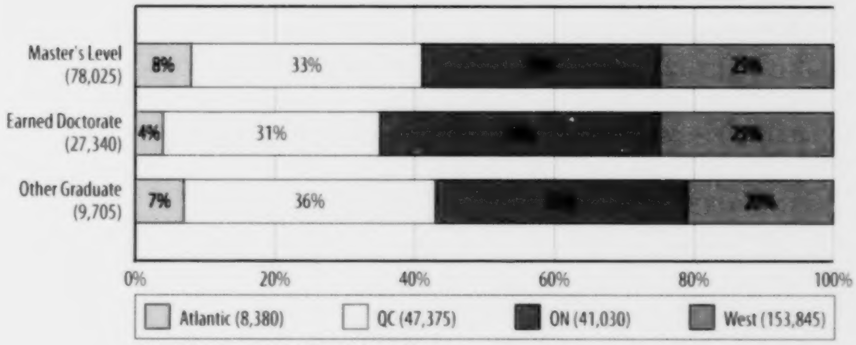
[23] Totals do not exactly match those reported in the July 30, 2004 edition of *The Daily* as those totals include university enrolments in non-university level programs. Further, data in this section do not include the 70,160 Canadian university enrolments identified as "other program level."

Figure 1.7a
Canadian Undergraduate-Level University Enrolments by Region, 2001–2002



Source: Statistics Canada; author's calculations.

Figure 1.7b
Canadian Graduate-Level University Enrolments by Region, 2001–2002



* Numbers may not add to 100% due to rounding.
Source: Statistics Canada; author's calculations.

Enrolments by Major Field of Study

The following figures (Figure 1.8a and 1.8b) show university enrolments in further detail by dividing the figures by major field of study.[24] Each shows the distribution of university student enrolment by discipline group, Atlantic province and region.

At the undergraduate level, a considerable proportion (ranging from 13% in QC to 38% in the West) of enrolments do not fit within the three main groups of disciplines (natural sciences and engineering, social sciences and humanities, and health professions and occupations); thus, caution should be taken when examining enrolments with this level of gradation.

Of those enrolments identified by field of study in 2000–2001, most were found in the social sciences and humanities disciplines for each Canadian region. Québec (62%) showed the highest proportion while the more (ON—master's=34%; doctorate=40%) or equal (West=25% each) proportions of Canada's enrolments at the master's and doctorate levels.

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[24] Due to recent changes to enrolment data, figures were not available, by province and field of study, beyond 2000-2001; due to the transition from USIS to ESIS data as well as the change in FOS coding, totals do not match those reported in the July 30, 2004 edition of *The Daily* as that document used a different coding scheme (CIP) than found here (See Appendix A for details).

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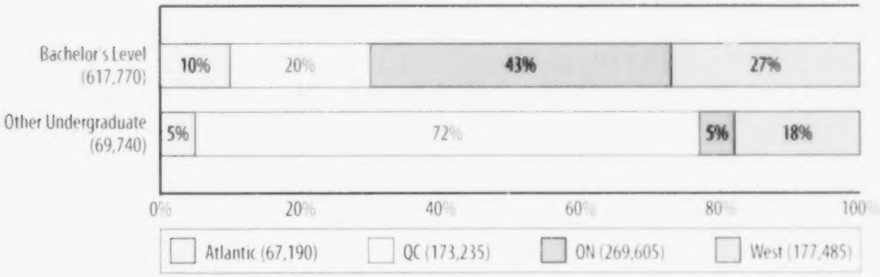
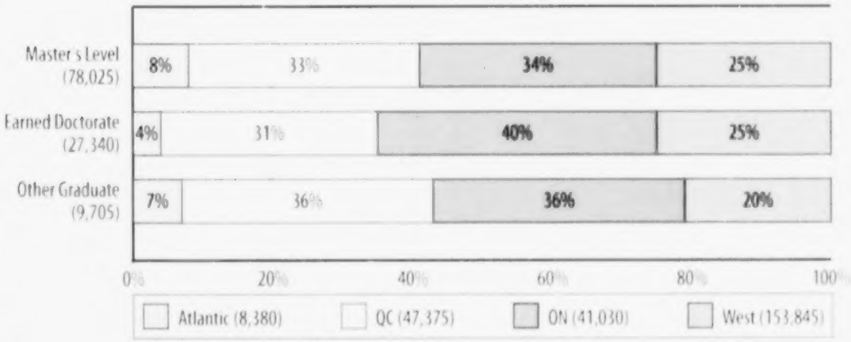
Canadian Undergraduate-Level University Enrolments by Region, 2001–2002



Source: Statistics Canada; author's calculations.

Figure 1.7b
Canadian Graduate-Level University Enrolments by Region, 2001–2002



* Numbers may not add to 100% due to rounding.
Source: Statistics Canada; author's calculations.

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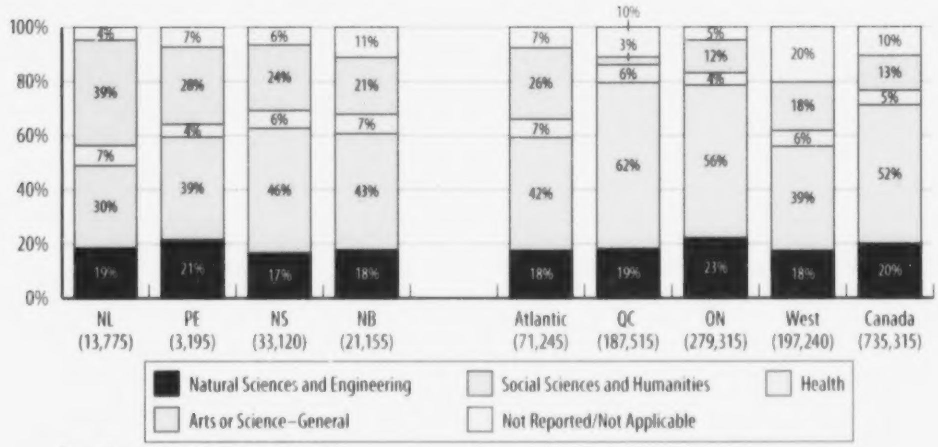
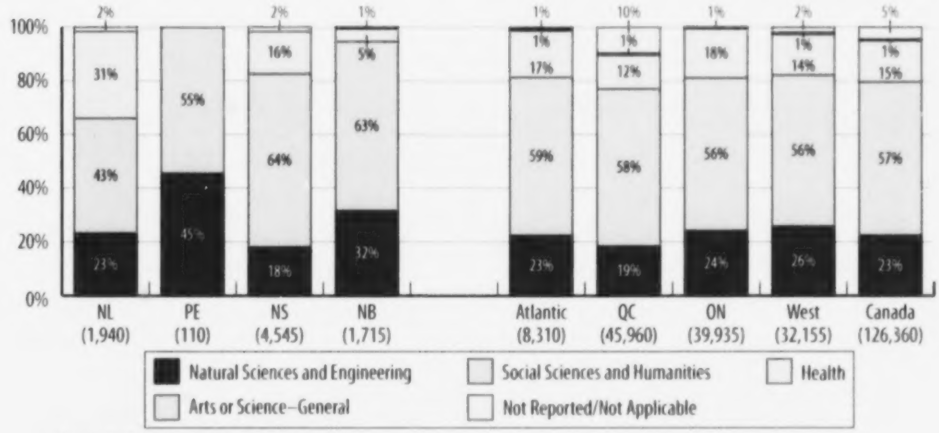
Western provinces (39%) showed the lowest. Enrolments in the natural sciences and engineering disciplines were also strong, with fairly similar proportions in each region (ON was slightly higher). The same held true for enrolments in the health disciplines as each region's proportion of enrolments were between 4 and 7%.

Figure 1.8a
University Undergraduate Student Enrolment by Discipline Group, Atlantic Province and Region, 2000–2001



Souce: Statistics Canada; author's calculations.

Figure 1.8b
University Graduate Student Enrolment by Discipline Group, Atlantic Province and Region, 2000–2001



Souce: Statistics Canada; author's calculations.

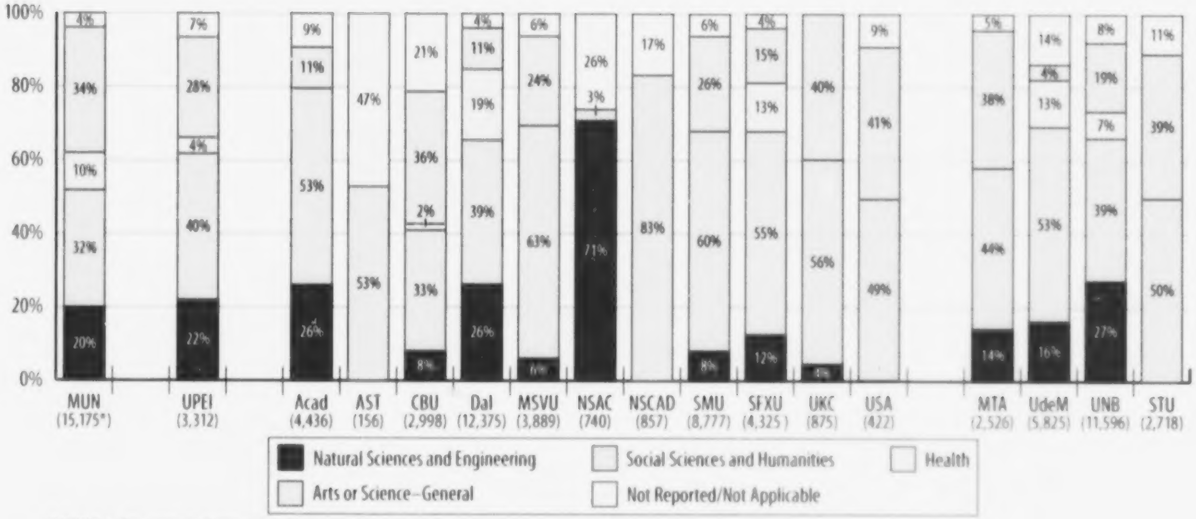
In Atlantic Canada, similar distributions were evident across provinces with the social sciences and humanities accounting for the majority of discipline-specific enrolments, followed by natural sciences and engineering then health. It should be noted, however, that proportions of enrolments in "Arts or Science—General" were considerably higher at the provincial level, with Newfoundland and Labrador having the largest Atlantic percentage (39%).

At the graduate level, proportionately less enrolments did not fit into one of the three main categories.[25] Within graduate programs, regional-level enrolments were also concentrated in the social sciences and humanities disciplines (56–59%) with natural sciences and engineering again making up a large core (19–26%). Here, each region had proportionately more enrolments in health disciplines (12–17%) than was the case in undergraduate university enrolments.

What may be surprising is the seemingly high proportion of Atlantic enrolments in the health disciplines, given that the region has just two medical schools (notwithstanding the Maclean's categorization). However, in addition to training medical doctors, Atlantic universities educate students enrolled in health disciplines that prepare them for other health professions and occupations. As shown in the Atlantic data of Figure 1.8b for example, 5% of New Brunswick's graduate level enrolments were in the health disciplines despite the fact that this province does not have a medical school.

Figure 1.9 looks closer at the Atlantic region and demonstrates the distribution of student enrolments, as of 2000–2001, for each Atlantic university by discipline group.[26]

Figure 1.9
Enrolments by Atlantic Canadian University and Discipline Group, 2000–2001



* MUN data from provincial reporting.
Souce: Statistics Canada; author's calculations.

As expected, enrolments vary considerably from university to university in Atlantic Canada. While enrolments in the social sciences and humanities disciplines represent a common theme for most universities, the region educated a considerable proportion of natural sciences and engineering students in 2000–2001.[27] Furthermore, although the Atlantic region has only two medical schools, it educates health

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[25] Ranging from 1 to 3% in three of the four regions, and each Atlantic province, with Quebec having 1% of its enrolments in "Arts and Science—General" and 10% as either not applicable or not reported.

[26] Memorial University of Newfoundland (MUN) data are taken from provincial statistics as it is the only university reported for that province. Analysis by level of study is not provided here due to the small population in several cases.

[27] Although more recent comparable Atlantic data were not available, data in the MPHEC database show that for the Maritime provinces, the distribution of enrolments by discipline remained the same for the latest year available (2003-2004). At the university level, some shifts were observed; these were largely a result of movement in and out of the "Arts or Science–General" and "Not Reported/Not Applicable" categories.

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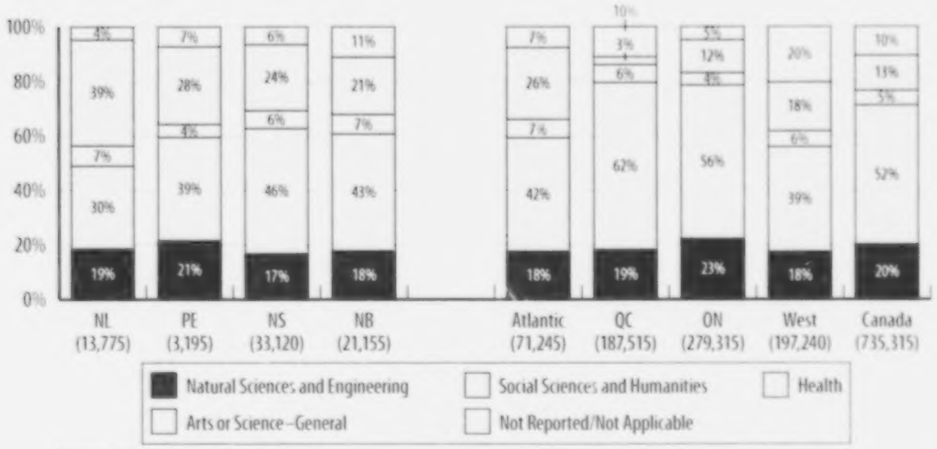
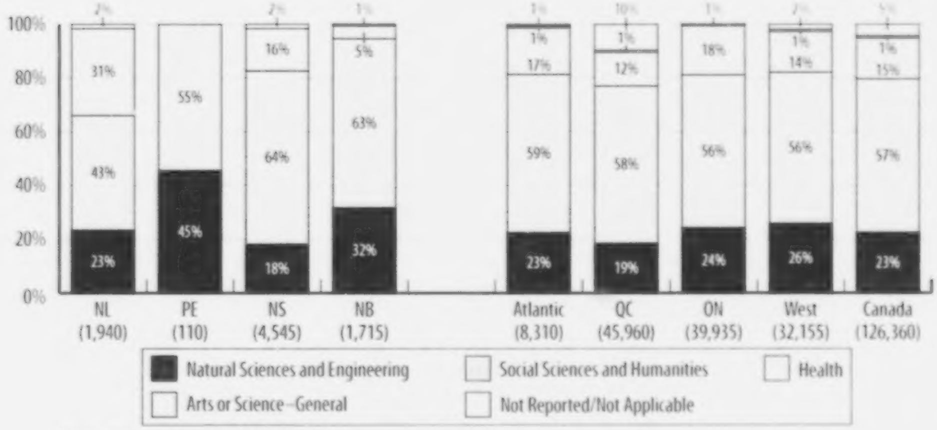


Souce: Statistics Canada; author's calculations.

Figure 1.8b
University Graduate Student Enrolment by Discipline Group, Atlantic Province and Region, 2000–2001



Souce: Statistics Canada; author's calculations.

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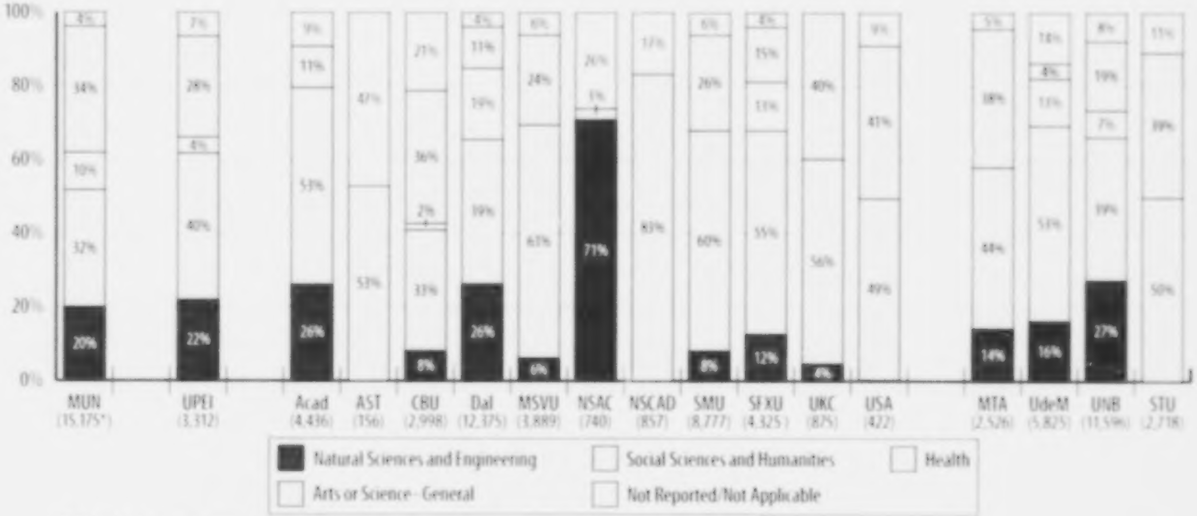

* MUN data from provincial reporting.
Souce: Statistics Canada; author's calculations.

As expected, enrolments vary considerably from university to university in Atlantic Canada. While enrolments in the social sciences and humanities disciplines represent a common theme for most universities, the region educated a considerable proportion of natural sciences and engineering students in 2000–2001.[27] Furthermore, although the Atlantic region has only two medical schools, it educates health students in seven of its universities through programs centred on various health professions and occupations (but not necessarily the training of medical doctors).

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[25] Ranging from 1 to 3% in three of the four regions, and each Atlantic province, with Quebec having 1% of its enrolments in "Arts and Science – General" and 10% as either not applicable or not reported.

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[27] Although more recent comparable Atlantic data were not available, data in the MPHEC database show that for the Maritime provinces, the distribution of enrolments by discipline remained the same for the latest year available (2003-2004). At the university level, some shifts were observed; these were largely a result of movement in and out of the "Arts or Science: General" and "Not Reported/Not Applicable" categories.

1.5 Atlantic Canada's Post-Secondary Research Environment

Atlantic Canada continues to be a critical and distinctive contributor to Canada's post-secondary learning and innovation environment. The region is home to 17 of the country's 94 (if including AST which is not a member of AUCC) universities, universities that have received national recognition for their contributions to the academic community[28] and that provide key contributions to the region and the Canadian economy in general. While home to just 7% of the country's population, the Atlantic provinces employed 12% of its full-time faculty and educated close to 10% of its university students making it a significant source of higher education teaching and learning.

The important contribution made by Atlantic Canada's universities does not seem to be adequately recognized under the current funding mechanisms of the Innovation Strategy as shown in the following chapters. For although the federal government's innovation documents call attention to the teaching and learning component of university practices, recent funding is almost entirely directed toward R&D capacities, and enhancement of those capacities, so that R&D can be transferred to the marketplace.[29]

The Impact of the Relatively Small Size of Atlantic Canadian Universities

The relatively small size of Atlantic Canada's universities, an enticement for some of the top students from across the country and internationally, is also one of its major handicaps in terms of attracting national R&D investment. Even in Atlantic Canada's largest R&D and education facilities (medical-doctoral and comprehensive universities), size still presents challenges relative to: (a) providing support for proposal development similar to that provided in larger universities, (b) enabling a critical mass of researchers and assistants to be involved in a project and (c) the capacity to house multiple research projects within the university's infrastructure.

As noted by the Atlantic Provinces Economic Council (APEC) (2002), "The disproportionate number of smaller universities in this region along with smaller pools of researchers and a limited number of post-graduate programs constrains the capacity for research…The university community in Atlantic Canada suggest this situation is deteriorating, with star researchers being pulled away to better financed institutions elsewhere in Canada." The AUCC has also raised this issue at the national level and suggested that special federal funding be directed at enhancing the innovation potential of smaller universities (of which a disproportionate number are in Atlantic Canada) "to help them establish or shore up their foundation of research excellence according to institutional and/or regional priorities."

In addition, universities and their stakeholders have also noted the increased difficulty in managing the indirect costs of research which have grown alongside increases in university R&D. For most research funding programs, the money is only to be applied to direct costs pertaining to research projects. However, indirect costs, "the central and departmental administrative costs that institutions incur to support research, but are not attributable to specific projects"[30] impact university research capacity as these costs accumulate and result in an increased financial burden, particularly for smaller universities, in developing or enhancing their research activity.

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[28] For example, three of the region's universities (SFXU, MTA, Acad) topped the 2004 Maclean's rankings in the Primarily Undergraduate category while the University of Prince Edward Island (UPEI) ranked third, in the undergraduate category, for Research University of the Year 2004 by ReSearch Infosource.

[29] Although it is worth noting that some funding has been invested to support early research exposure (e.g., Canada Graduate Scholarships). In addition the federal government has also developed funding mechanisms designed to help increase access to post-secondary education (i.e. Canada Learning Bonds, Canada Education Savings Grant) which could also be considered a contribution to early research exposure opportunities.

Positively, some provisions have been put in place to provide leeway for smaller universities to increase their research capacity (the staggered funding formula within the Indirect Costs program, special allocations within the Canada Research Chairs Program and the Atlantic Innovation Fund for example, discussed in greater detail in Chapters 4 and 5). These initiatives are designed to help smaller universities to increase research performance and as such are commendable first steps; however, they perpetuate the tendency to assume that smaller universities ought to become more like larger ones in their research-related endeavours. As noted in the Introduction of this report and further discussed in the following chapters, this viewpoint is something that ought to be carefully examined.

The Impacts of a Greater Reliance on PSE R&D Relative to Economic Development

As noted in Chapter 2 and elsewhere in this report, R&D-ready industry is limited in Atlantic Canada. As such, universities are the key sector for R&D activity in this region. This role exceeds what is expected of equivalent universities in other parts of the country that have easier access to other forms of research infrastructure including materials, personnel and investments. In this respect, Atlantic Canadian universities face considerable financial, and non-financial, hurdles. Not only must they provide resources to meet the teaching and learning needs of their students and faculty but they must also provide resources to meet research demands. In shouldering these dual roles, several questions arise:

- How are Atlantic universities being supported for their disproportionate roles in this regard?
- What needs to be done to make the most of this heavy reliance on the post-secondary sector for both education and the strengthening of regional knowledge industries?

The remainder of this report tries to answer these questions, at least in part, by looking first at the international, national and regional R&D environment then moving to an analysis of research funding available to, and received by, Canadian universities. It places Atlantic Canada's post-secondary research funding within the context of national R&D and reflects upon these data within the context of its economic and post-secondary environment as described in this chapter.

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[30] As defined on the Government of Canada's Indirect Costs program website: www.indirectcosts.gc.ca/home_e.asp#eligibility

Chapter 2—*Understanding the Context for Investment and Change*

findings

- Atlantic Canada's total R&D expenditures increased 40% between 1995 and 2002; this growth did not change the region's proportion of the national total (down 0.5% between 1995 and 2002).

- Expenditures on R&D in the higher education (HERD) and business enterprise (BERD) sectors approximately doubled (HERD=88%, BERD=85%), on a per capita basis, for Canada as a whole, between 1995 and 2002; business enterprise continues to be the major source of Canadian R&D expenditures, at three times the HERD per capita level.

- Atlantic Canada's growth in HERD per capita followed the national trend and by 2002 the region had a per capita level that compared with Canada as a whole. The region's increase in BERD per capita however lagged far behind the increase noted at the national level thus widening the gap between Atlantic Canada and the rest of the country on that count.

HERD and BERD Per Capita
Canada vs. Atlantic Canada, 1995 and 2002

	Canada		Atlantic Canada	
	1995	2002	1995	2002
HERD	$55	$104	$47	$105
BERD	$180	$332	$38	$51

*Constant dollars.

- The growth in HERD per capita in Atlantic Canada is significant considering the make-up of the region's post-secondary system. Given the region's concentration on undergraduate education (80% of its universities are primarily undergraduate) and its relatively low proportion of graduate student enrolments (7%), particularly at the doctoral level (4%), the level of per capita R&D investment by Atlantic Canada's universities is substantial, reflecting not only the universities' commitment to R&D but also the region's heavy reliance on this sector despite its primarily undergraduate composition.

2.1 Overview

Building upon data provided in Chapter 1, this chapter turns directly to R&D spending to determine what the research funding environment has been for Atlantic Canada and for Canada as a whole. It begins by first placing Canada within the international context drawing comparisons between R&D expenditures in this country and those found in other R&D countries at two points in time (Section 2.2). From there, the analysis is narrowed to a regional perspective with detailed examination of Atlantic Canada's R&D expenditures in relation to the rest of Canada. This analysis includes a closer look at the Atlantic region from both provincial and university standpoints (Sections 2.3 and 2.4). In each case, we see the higher education sector's increasingly predominant role in Atlantic R&D.

2.2 Canada in the International Context

In the 2001 Speech from the Throne, the federal government set out a strategy designed to strengthen Canada's international R&D competitiveness. Its Innovation Strategy aims to place Canada among the top countries in the world, with a specific target of becoming fifth overall by 2010. To do this, the government is actively striving, along with businesses, provincial governments and other partners, to strengthen Canada's innovation capacity by increasing commercialization, re-investing in public and private sector R&D and helping to build partnerships among the country's innovative institutions. For example, provincial governments invested in R&D programs and initiatives designed to strengthen their own capacity, with the Atlantic provinces moving forward significantly since the Commission's (2000) *Report on Post-Secondary Research Trends in Atlantic Canada* (as discussed in Chapter 5).

Canada's International Performance

As Figure 2.1 demonstrates, Canada has made advances in R&D investment since 1995 (the latest data available in the Commission's previous report). When measured in relation to gross domestic product (GDP) R&D investment increased 21%, from 1.6 to 1.94 (gross domestic expenditures on R&D as a percentage of gross domestic product, GERD/GDP).[31] Within the business sector (BERD/GDP), growth was slightly lower, at approximately a quarter point increase, moving from 0.95 in 1995 to 1.11 in 2002. Expenditures in the higher education sector showed the most growth (37%) between 1995 (0.37) and 2002 (0.59).

These advances are, however, tempered by the fact that other countries have also made gains. As a result, although the country increased its expenditure ratios between these years, it did not increase its rank, within the international context, for two of the three measures: GERD/GDP (1995 and 2002=12th) and BERD/GDP (1995=13th, 2002=14th) (Table 2.1).

Within the third measure (HERD/GDP) however, Canada made significant advances. Among OECD countries, its HERD/GDP ranking increased 10 points, from 14th to fourth, between 1995 and 2002. This reflects a greater reliance on the PSE sector in Canada for the promotion and stimulation of innovation, of which R&D is a key component.

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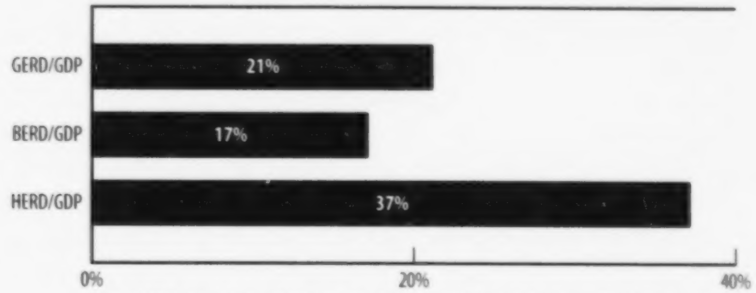
[31] GERD represents the absolute amount invested in R&D in a country by the different national players and is calculated by adding together "the intramural expenditures on R&D performed on the national territory in a given period. It includes R&D performance within a country and funded from abroad but excludes payments made abroad for R&D." (OECD, 1993) It should be noted that as Gross Domestic Product (GDP) decreases, the ratio of GERD to GDP increases. In this case, an apparent increase in GERD/GDP would be due to a reduction in GDP not an increase in GERD investment. The same holds true for BERD/GDP and HERD/GDP ratios.

Figure 2.1
Growth in Canadian R&D Expenditures as a Percentage of Gross Domestic Product by Sector (GERD/GDP, BERD/GDP, HERD/GDP), 1995 to 2002



Source: OECD, *Science Industry Technology and Scoreboard 1999: Benchmarking Knowledge-Based Economies*, Tables 3.1.1 and 4.1.1; OECD, *Main Science and Technology Indicators*, 2003, Tables 02, 24, 46.

Table 2.1
International Comparisons of Research Expenditures by Sector, 1995 and 2001

Country	GERD/GDP		BERD/GDP		HERD/GDP	
	2001	1995	2001	1995	2001	1995
Sweden	4.27	3.6	3.31	2.67	0.83	0.79
Finland	3.40	2.4	2.42	1.49	0.61	0.46
Japan*	3.09	2.8	2.28	1.94	0.45	0.40
Iceland	3.06	1.5	1.80	0.49	0.58	0.42
Korea	2.96	2.7	2.25	1.98	0.31	0.22
United States*	2.82	2.6	2.10	1.88	0.40	0.40
Switzerland	2.63[a]	2.7	1.95[a]	1.94[d]	0.6[a]	0.67[d]
Germany*	2.49	2.3	1.76	1.53	0.40	0.42
France*	2.20	2.3	1.37	1.43	0.41	0.39
Denmark	2.19[b]	1.9	1.42[b]	1.10	0.45[a]	0.47
Belgium	1.96[b]	1.6	1.46[a]	1.07	0.47[b]	0.43
Netherlands	1.94[a]	2.1	1.08	1.08	0.57[a]	0.60
Canada*	**1.94**	**1.6**	**1.11**	**0.95**	**0.59**	**0.37**
United Kingdom*	1.90	2.0	1.28	1.32	0.41	0.38
Austria	1.90	1.5	1.13[c]	0.83[e]	0.53[c]	0.52[e]
Italy*	1.07[a]	1.0	0.56	0.54	0.33[a]	0.26

* A G7 country; [a] 2000 data; [b] 1999 data; [c] 1998 data; [d] 1996 data; [e] 1993 data.

Source: (2001 data) OECD *Main Science and Technology Indicators*, 2003, Tables 02, 24, 46; (1995 data) OECD, *Science Industry Technology and Scoreboard 1999: Benchmarking Knowledge-Based Economies*, Tables 3.1.1 and 4.1.1.

The data in the following sections (and chapters) show that a heavy reliance on the PSE sector is evident in each of the country's four regions with this sector playing an even more important role in Atlantic Canada than in Canada as a whole.

2.3 National and Regional Perspectives on R&D Investment

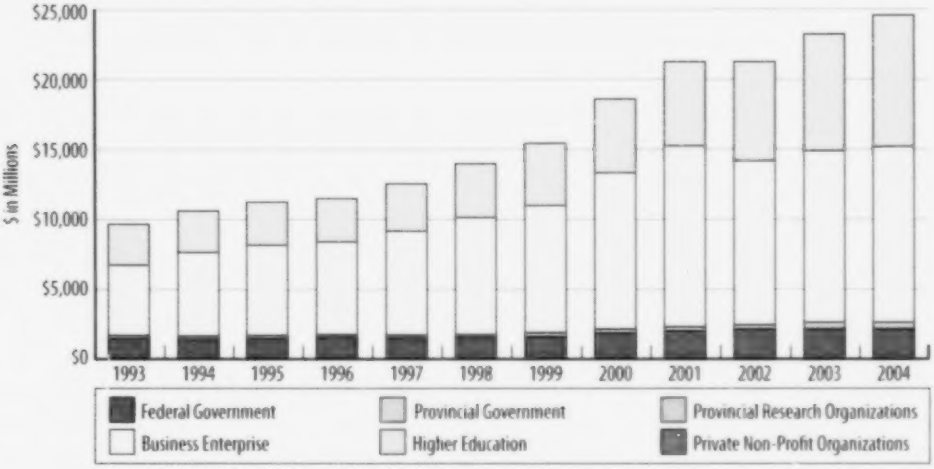
National R&D Expenditures: Growth by Sector/Region/Province

Recalling information from the previous report, from 1989 to 1998, overall growth in Canadian R&D expenditures was mostly the result of an increase in business sector involvement (+86%). This growth was followed closely by expenditures in the private non-profit (+78%) then higher education (+34%) sectors.

Federal government expenditures experienced only slight growth (4%) while provincial government expenditures decreased 3%.

As Figure 2.2 illustrates, for the most recent long-term interval, 1993 to 2004, Canada's financial involvement in R&D more than doubled. In 1993, Canada spent just under $10 billion (constant dollars) in R&D activities; by 2004, this number reached over $24 billion. However, this growth was not evenly distributed across participating sectors. The growth in R&D expenditures during this period can mostly be attributed to substantial increases in the higher education (+222%) and business (+110%) sectors. R&D activities by the federal and provincial governments also significantly increased (+62% and +96%, respectively). Contrary to measures presented in the *Report on Post-Secondary Research Trends* (and in the preceding paragraph), private non-profit organizations experienced only a slight increase between 1993 and 2004 (+3%) while provincial research organizations decreased (-48%) expenditures over the last decade.

Figure 2.2
National R&D Expenditures by Sector, 1993 to 2004

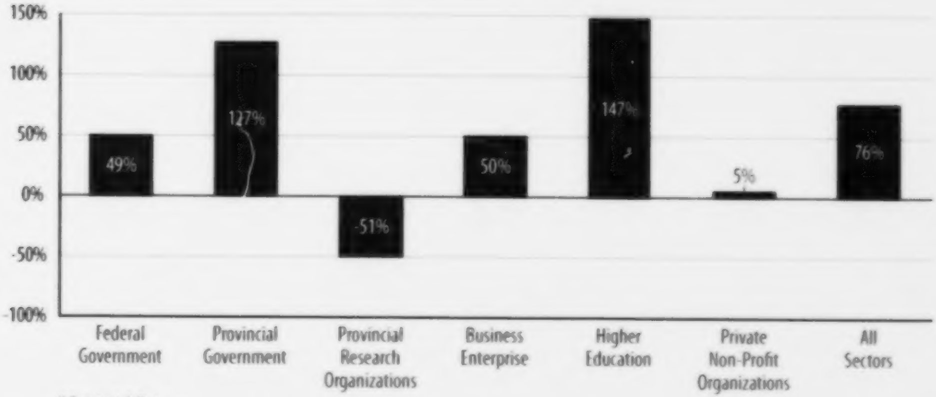


* Constant dollars.
** Includes the National Capital Region.
Source: Statistics Canada—GERD, Canada, 1993 to 2004 by Province, 1993 to 2002; author's calculations.

In looking at just the last six years (1998 to 2004—the latest data available in the previous report and since then), growth rates suggest a more recent rejuvenation on behalf of provincial governments (Figure 2.3). While over the period of 11 years provincial government expenditures increased a substantial 96%, in the last five years these expenditures increased 127% (after decreasing in the 1989 to 1998 period as noted above). Higher education experienced the highest level of growth (+147%) in the last six years.

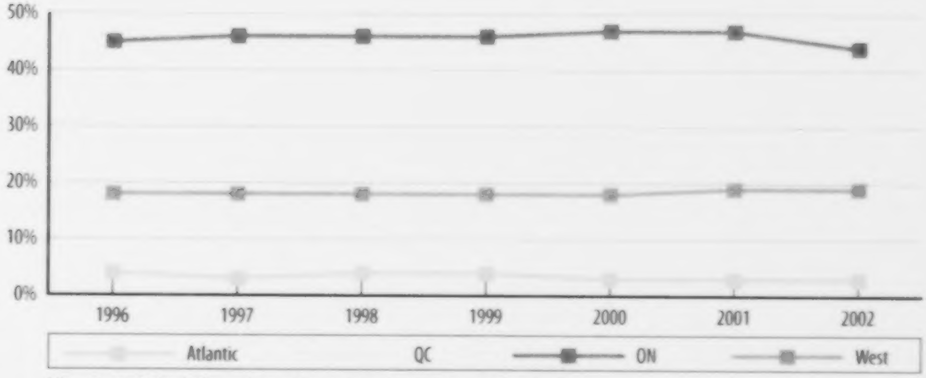
Throughout this period of expansion, Québec and Ontario remained the dominant national players (Figure 2.4). In 2002, the latest year for which provincial data are available, these two provinces accounted for approximately three quarters (29% and 44%, respectively) of total national expenditures, with this position unchanged between 1996 and 2002. The West accounted for the next largest amount (19% in 2002) followed by Atlantic Canada at 3%.

Figure 2.3
Growth in National R&D Expenditures by Sector, between 1998 and 2004



* Constant dollars.
Source: Statistics Canada—GERD, Canada, 1993 to 2004 and by Province, 1993 to 2002; author's calculations.

Figure 2.4
Proportion of National R&D Expenditures by Region, 1996 to 2002



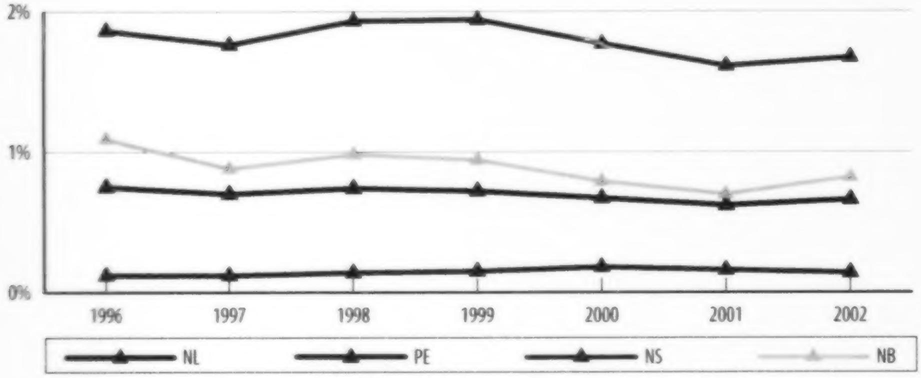
* Percentage includes the National Capital Region although it is not shown (5% in 2002).
The territories are also not shown as expenditures were <1%.
Source: Statistics Canada—GERD, Canada 1993 to 2004 and by Province, 1993 to 2002; author's calculations.

Although not discernible in Figure 2.4, Atlantic Canada's percentage of national expenditures, which had declined between 1987 and 1996 (as noted in the previous report), experienced a brief rise between 1997 and 1999 before continuing to decrease. In 2002, it stood at just over 3%—and slightly lower than it had been in 1996 (1996=3.81; 2002=3.29). Further, by 2002, all Atlantic provinces were at approximately the same level they had been in 1996, with three of the four provinces having decreased slightly (Figure 2.5—on the following page).

When the most recent per capita expenditures are compared (Figure 2.6—on the following page), it is clear that Atlantic Canada's R&D performance continues to lag behind the rest of Canada, despite its increases in total spending (as shown later in the chapter). Overall, Atlantic expenditures per capita were less than half ($297) those reported for Canada as a whole ($674) and almost one-third lower than its closest region, the West ($439), in 2002. Nova Scotia ($378) had the highest per capita levels in Atlantic Canada coming at par with two of the Western provinces (Saskatchewan ($398); Manitoba ($364); not shown in graph).

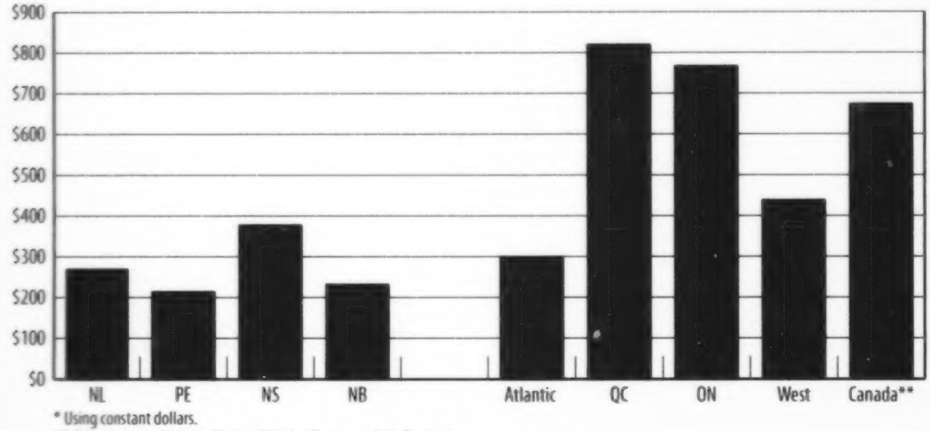
The remaining three provinces were behind in per capita expenditures with Newfoundland and Labrador at $270, New Brunswick at $232, and Prince Edward Island at $214.

Figure 2.5
Atlantic Canada's Proportion of National R&D Expenditures by Province, 1996 to 2002



* Calculations include the National Capital Region (NCR) and the Territories.
Source: Statistics Canada—GERD, Canada, 1993 to 2004 and by Province, 1992 to 2002; author's calculations.

Figure 2.6
R&D Expenditures Per Capita by Region and Atlantic Province, 2002



* Using constant dollars.
** Calculations include the National Capital Region and the Territories.
Sources: Statistics Canada—GERD, Canada 1993 to 2004 and by Province, 1992 to 2002;
Statistics Canada—Demography Division (www.gnb.ca/0160/Economics/PopulationCanadaProvinces1.htm); author's calculations.

As illustrated in Figure 2.7, over the past six years, each Atlantic province experienced increases in per capita expenditures, with Nova Scotia and Prince Edward Island experiencing a one-year decrease in 2001 and 2002 respectively.[32] Nova Scotia accounted for the highest level of per capita expenditures in Atlantic Canada (ranging from $228 in 1996 to $378 in 2002; or nearly 2% of the national total throughout the period).

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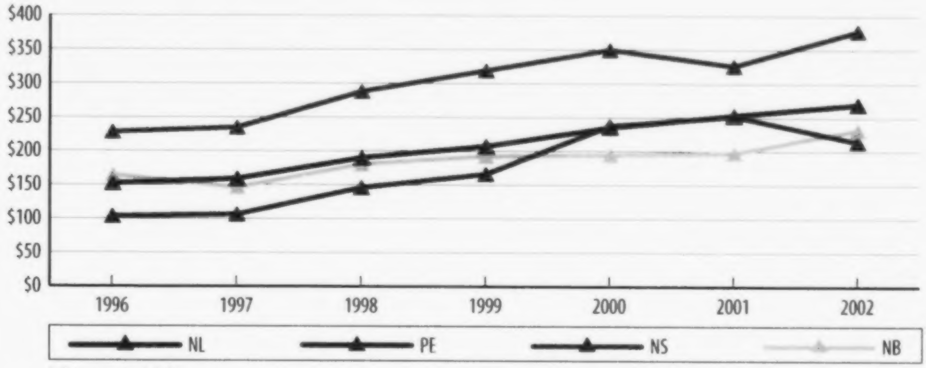
[32] As Prince Edward Island's decrease in expenditures was in the last year of reporting, it is possible that the decrease could be extended beyond one year.

Figure 2.7
Per Capita R&D Expenditures in the Atlantic Provinces, 1996 to 2002



* Using constant dollars.
Source: Statistics Canada—GERD, Canada,1993 to 2004 and by Province, 1993 to 2002;
Statistics Canada—Demography Division (ww.gnb.ca/0160/Economics/PopulationCanadaProvinces1.htm); author's calculations.

R&D Expenditures by Performing Sector—Canada and Atlantic Canada

In this section, data show that the answer to the question "who performs research?" is significantly different in Atlantic Canada than in the country as a whole. While expenditures increased for most sectors in both Atlantic Canada and Canada as a whole,[33] in Atlantic Canada, the higher education and federal government sectors were the most significant R&D performers. In Canada as a whole, the higher education sector was a strong R&D contributor but the business sector remained the major performer. If Atlantic Canada were to be more like Canada as a whole, a significant change in business sector performance would have to occur as the presence of business R&D investment is considerably lower, and has not grown at the same rate, as at the national level.

To elucidate this difference, Figure 2.8 shows that, as was the case in 1995, Atlantic Canadian R&D was principally performed by the higher education sector (59%) in 2002. This was much higher than this sector's activity nationally which stood at just 33% for the same year. For Canada as a whole, the business sector accounted for the largest portion of research activity in both 1995 and 2002 (1995 = 58%; 2002 = 55%); a markedly different percentage than in Atlantic Canada where expenditures in business R&D accounted for only 25% in 1995, and just 16% in 2002. Again in 2002, Atlantic Canada relied much more on the federal government than did Canada as a whole, with federal expenditures accounting for nearly one quarter of the Atlantic total but only one-tenth of expenditures at the national level. On a provincial level, there were additional variations. While all four Atlantic provinces showed higher education as the principal R&D performer, secondary performers varied across provinces and, to a lesser extent, from 1995 to 2002.

In Newfoundland & Labrador, little has changed proportionately since 1995. Then, higher education accounted for 58% of total R&D expenditures by performing sector; by 2002, this percentage increased to 64%, securing its position as the largest contributing sector to R&D in the province. The second major source of expenditures was the federal government (1995 = 27%; 2002 = 21%) followed by business enterprise (1995 and 2002 = 11%), with minimal expenditure levels found in the provincial government sector

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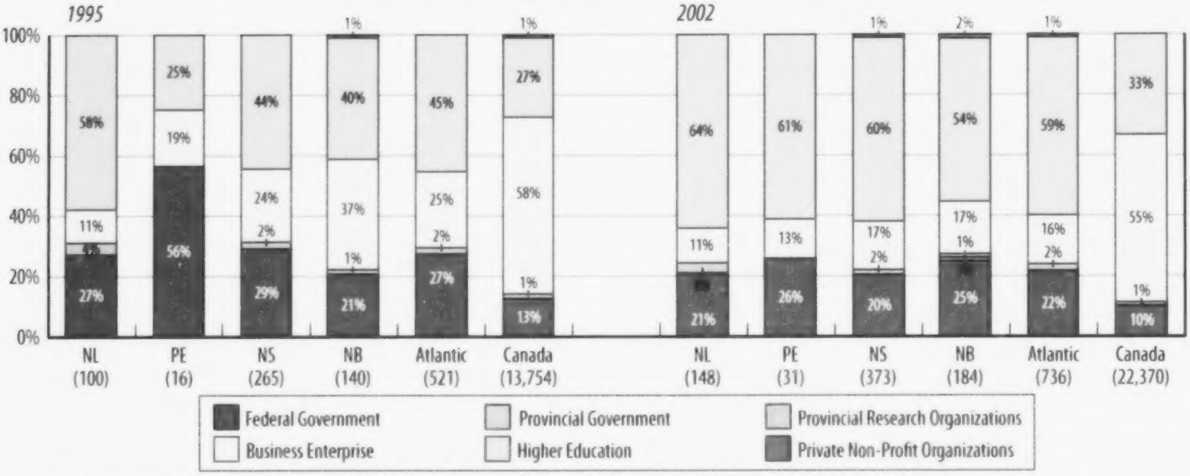
[33] In Atlantic Canada, expenditures increased for all sectors; at the national level, expenditures in provincial research organizations and private non-profit organizations decreased during this time.

(1995 = 4%; 2002 = 3%). For all sectors, expenditures increased between these years, with the higher education sector showing the most amount of growth (from $47 million in 1995 to $90 million in 2002).[34]

Figure 2.8
Who Does Research? R&D Expenditures by Performing Sector, Canada and Atlantic Canada, 1995 and 2002



* In Canada, provincial research organizations and private non-profit organizations account for less than 1% of expenditures.
Source: Statistics Canada—GERD, Canada, 1993 to 2004 and by Province, 1992 to 2002;
Statistics Canada—Demography Divison (www.gnb.ca/0160/Economics/PopulationCanadaProvinces1.htm); author's calculations.

In Prince Edward Island, R&D remained the function of only three sectors; however, the distribution of expenditures changed between 1995 and 2002. In 1995, federal government and higher education expenditures accounted for nearly three quarters of the province's total (56% and 25%, respectively). By 2002, the sum of these percentages increased but distributions were reversed as the higher education sector became the major source of expenditures (higher education = 61%, federal government = 26%). Business enterprise remained the final source of R&D performance decreasing its proportion of expenditures from 19% in 1995 to 13% in 2002. As was the case with Newfoundland and Labrador, dollar amounts increased for sectors reporting expenditures (with those not active in 1995 continuing to be absent in 2002), with the higher education sector showing the greatest increase (in constant dollars, expenditures increased from $3 million in 1995 to $18 million in 2002).

While somewhat different in 1995, Nova Scotia and New Brunswick had similar R&D composition, by performing sector, in 2002. In 1995, higher education accounted for the highest proportion of performing sector expenditures in both provinces (NS = 44%; NB = 40%) and in 2002 it remained the highest, having increased in proportion (NS = 60%; NB = 54%) and in terms of expenditures reported (NS—1995=$95 million, 2002=$212 million; NB—1995=$45 million, 2002=$94 million)[35] in both provinces. In 1995, Nova Scotia's second highest sector, in terms of expenditure percentage, was the federal government (29%), followed by the business sector (24%). For New Brunswick, the distribution was reversed; the business sector accounted for a larger percentage (37%) than the federal government (21%). In 2002, the proportion of expenditures in the business sector was the same for both provinces (17%), having decreased in NB while staying approximately the same in NS. This proportional decrease was due to increased expenditures for both sectors in Nova Scotia but an increase only in the federal government sector in New Brunswick—business sector expenditures decreased $12 million between these years.[36] As was the case in 1995, provincial governments, provincial research organizations and private non-profit organizations accounted for the remaining R&D activity with expenditures having increased, or remained the same, in each sector but provincial research organizations, where expenditures in Nova Scotia decreased from $1 million in 1995 to zero in 2002.

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[34] Constant dollars.

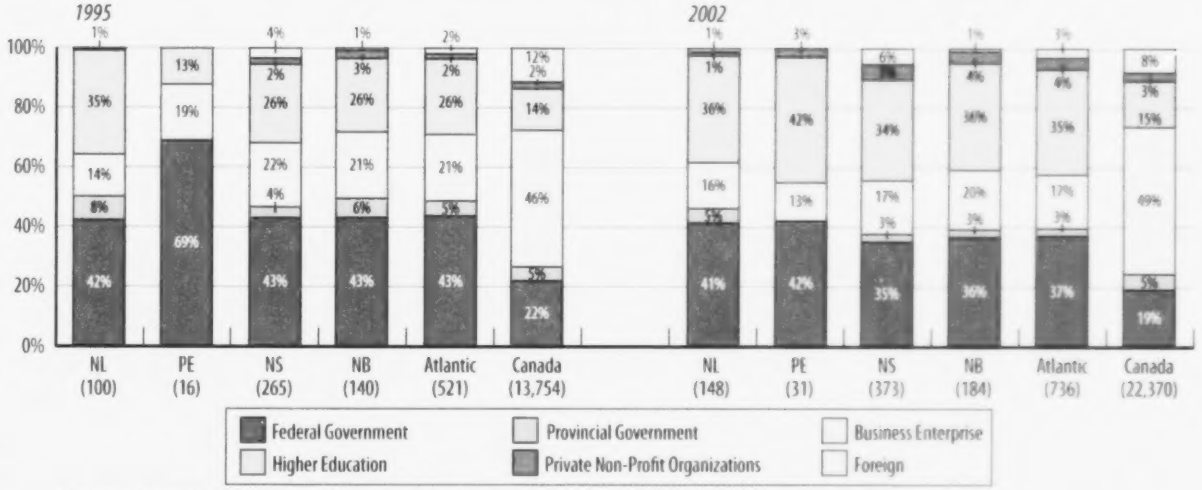
[35] Constant dollars.

R&D Expenditures by Funding Sector—Canada and Atlantic Canada

As was the case in responding to the question, "who does research?" the answer to the question "who funds research?" is significantly different in Atlantic Canada than in the nation as a whole.

Despite variability among the four provinces, it is clear that Atlantic Canada continues to rely more heavily on public sources for R&D funding, specifically the federal government and higher education sectors, than Canada as a whole. In the Commission's 2000 *Report on Post-Secondary Research Trends in Atlantic Canada*, the federal government accounted for the lion's share of Atlantic R&D; by 2002, this was no longer the case. While the federal government remained a major contributor having increased expenditures between 1995 and 2002 (from $183 million to $256 million), the higher education sector showed much greater growth, more than doubling its expenditures within the same period (1995=$111 million, 2002=$245 million). As a result of this sector's growth, the proportion of expenditures in both the federal government (37%) and higher education (35%) sectors was approximately the same in Atlantic Canada by 2002 (Figure 2.9).

Figure 2.9
Who Funds Research? R&D Expenditures by Funding Sector, Canada and Atlantic Canada, 1995 and 2002



* Includes the National Capital Region.
Note: Provincial Research Organizations did not have any reported expenditures, by funding sector, during these periods.
Source: Statistics Canada—GERD, Canada, 1993 to 2004 and by Province, 1993 to 2002; author's calculations.

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[36] *Nova Scotia*: federal government—1995=$62 million, 2002=$72 million; business enterprise—1995=$52 million, 2002=$61 million. *New Brunswick*: federal government—1995=$24 million, 2002=$44 million; business enterprise—1995=$42 million, 2002=$30 million.

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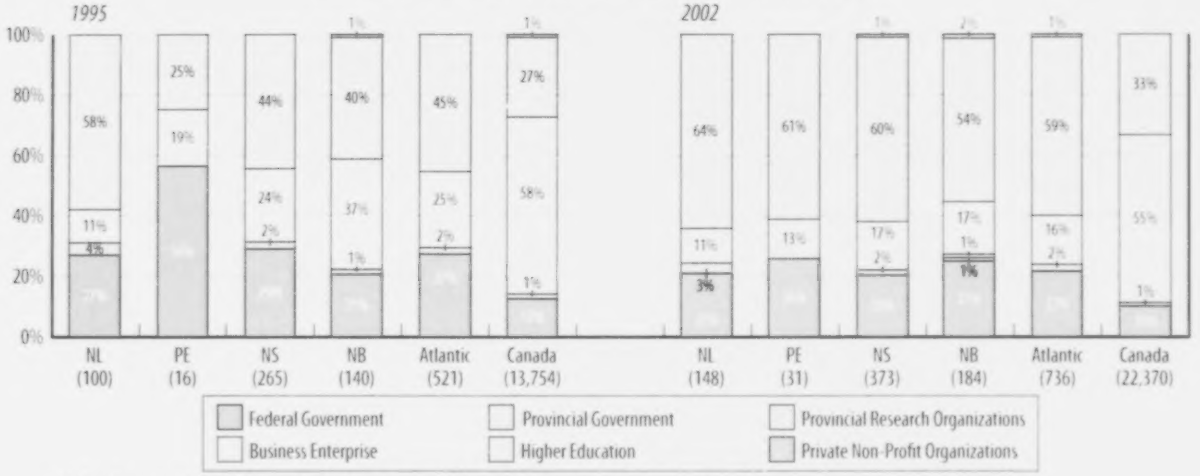
Figure 2.8
Who Does Research? R&D Expenditures by Performing Sector, Canada and Atlantic Canada, 1995 and 2002



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R&D Expenditures by Funding Sector—Canada and Atlantic Canada

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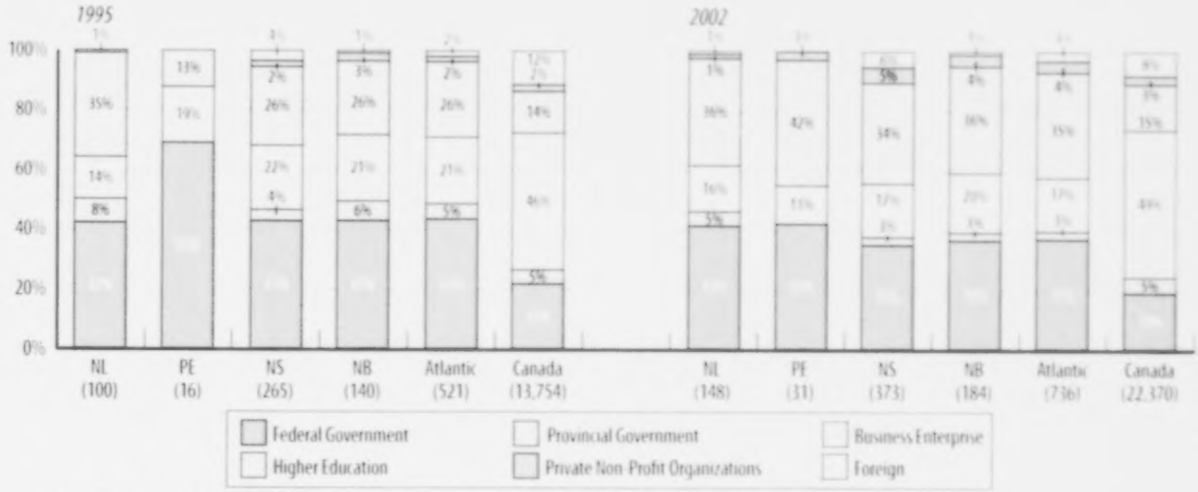
Figure 2.9
Who Funds Research? R&D Expenditures by Funding Sector, Canada and Atlantic Canada, 1995 and 2002



* Includes the National Capital Region.
Note: Provincial Research Organizations did not have any reported expenditures, by funding sector, during these periods.
Source: Statistics Canada—GERD, Canada, 1993 to 2004 and by Province, 1993 to 2002; author's calculations.

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[36] *Nova Scotia*: federal government—1995=$62 million, 2002=$72 million; business enterprise—1995=$52 million, 2002=$61 million. *New Brunswick*: federal government—1995=$24 million, 2002=$44 million; business enterprise—1995=$42 million, 2002=$30 million.

For Canada as a whole, business remained the primary source of R&D expenditures (by funding sector) accounting for nearly half (49% or more than $10 billion) in 2002. In Atlantic Canada, this sector accounted for 17% ($120 million) in the same year.

R&D Expenditures by Province within Atlantic Canada

Table 2.2

Per Capita R&D Expenditures by Funding Sector, Canada and Atlantic Canada, 1995 and 2002

Expenditures by Funding Sector*	1995 ($ Per Capita)	2002 ($ Per Capita)	Change ($)	Growth (%)
Federal Government				
Newfoundland & Labrador	59	111	52	89
Prince Edward Island	68	90	22	32
Nova Scotia	100	132	32	32
New Brunswick	65	84	19	30
Maritime	83	109	26	31
Atlantic	77	110	32	42
Canada	85	127	42	49
Provincial Government				
Newfoundland & Labrador	11	13	2	14
Prince Edward Island	0	0	0	N/A
Nova Scotia	9	13	4	49
New Brunswick	10	6	-3	-35
Maritime	9	9	1	9
Atlantic	9	10	1	10
Canada	19	36	17	91
Business Enterprise				
Newfoundland & Labrador	20	42	22	114
Prince Edward Island	19	28	9	49
Nova Scotia	50	65	15	29
New Brunswick	39	45	6	16
Maritime	43	54	11	25
Atlantic	38	51	14	37
Canada	180	332	153	85
Higher Education				
Newfoundland & Labrador	49	97	48	97
Prince Edward Island	12	90	77	624
Nova Scotia	62	128	66	107
New Brunswick	33	84	52	160
Maritime	46	107	61	133
Atlantic	47	105	58	124
Canada	55	104	49	88
Private Non-Profit Organizations				
Newfoundland & Labrador	1	4	2	160
Prince Edward Island	0	7	7	N/A
Nova Scotia	4	19	15	336
New Brunswick	4	9	4	103
Maritime	4	14	10	245
Atlantic	3	12	8	244
Canada	9	19	10	113
Foreign				
Newfoundland & Labrador	0	4	4	N/A
Prince Edward Island	0	0	0	N/A
Nova Scotia	9	21	12	141
New Brunswick	1	3	1	133
Maritime	5	12	7	141
Atlantic	4	10	6	169
Canada	45	57	11	25

Note: Provincial Research Organizations did not have any reported expenditures, by funding sector, during these periods.

* Constant dollars.

Sources: Statistics Canada—GERD, Canada, 1993 to 2004, and by Province 1993 to 2002;
Statistics Canada/Demography Division (www.gnb.ca/0160/Economics/PopulationCanadaProvinces1.htm); author's calculations.

Table 2.2 supports the claim that, overall, per capita R&D investment has grown considerably in the last few years. This table compares R&D expenditures per capita in 1995 and 2002, by funding sector, in each of the Atlantic provinces, the Maritime provinces as a whole, Atlantic Canada as a whole, and Canada. It shows the percentage growth during this time using constant dollars to control for the effects of inflation. Here, there is markedly higher growth than was found in the original report's 1989–1995 comparison.[37]

Newfoundland and Labrador

In Newfoundland and Labrador, the distribution of expenditures by funding sector was quite similar in 2002 as it had been in 1995, with the exception of foreign expenditures, which accounted for $4 per capita in 2002 but were non-existent in 1995. In terms of growth, Newfoundland and Labrador outpaced national levels for its three top sectors (federal government, higher education and business enterprise, respectively) while Canada as a whole outpaced the province with respect to provincial government expenditures (NL=14%; CAN=91%). Although growth had been strong in most respects, per capita amounts in Newfoundland and Labrador remained below, and well below for half of the sectors, the national average in 2002.

Prince Edward Island

Between 1995 and 2002, the federal government and higher education sectors continued to account for the majority of per capita expenditures in Prince Edward Island. However, in contrast to 1995 amounts, expenditures in these sectors were equal by 2002 ($90 per capita). This shift was reflected in growth between both years where expenditures in Prince Edward Island's higher education sector (624%) outpaced each Atlantic province (ranging from 97% to 160%) and Canada as a whole (88%). At the same time, growth in federal government expenditures (32%) was at par with Maritime levels (NS=32%, NB=30%) but below that found in Newfoundland and Labrador (89%) and Canada as a whole (49%).

Nova Scotia

In 2002, Nova Scotia continued to draw R&D funding from all six possible sources, with three key players (federal government, higher education and business enterprise, respectively). While still second to the federal government, per capita expenditures in higher education grew substantially (107%) between 1995 and 2002, resulting in a greater disparity between this sector ($128) and the business sector ($65) than was the case in 1995 (higher education = $62, business enterprise = $50). Among the Atlantic provinces, per capita expenditures were highest in Nova Scotia for all six sectors; although provincial government expenditures were the same as those found in Newfoundland and Labrador. Expenditure levels were at par or above the national level, in three of the six sectors (federal government, higher education, private non-profit organizations).

New Brunswick

Like Nova Scotia, R&D funding in New Brunswick was more varied between sectors than it was in Newfoundland and Labrador or Prince Edward Island. Among the six funding sectors however, it too was mainly supported by just three: federal government, higher education and business enterprise. New Brunswick outpaced national growth in two of the six funding sectors (higher education, foreign);

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[37] Notably, this analysis is limited. (Provincial governments in Atlantic Canada [and elsewhere] have developed R&D funding initiatives specific to their individual provinces that are not reflected in these data as they include expenditures only until 2002.) In the Atlantic provinces, this cut-off does not allow for an examination of the newest initiatives which are too early in their development. In New Brunswick for example, the New Brunswick Innovation Foundation (NBIF) is a highly visible source of R&D support; however, it was established in 2002 thus funding expenditures will not be visible until at least 2003 data. For this reason a more detailed examination of provincial government funding in each Atlantic province is provided in Chapter 5 of the report so as to provide readers with a broader, although not comprehensive, view of Atlantic R&D funding.

however, it was the only Atlantic province to show decreases (per capita provincial government expenditures decreased 35%) when comparing 1995 to 2002. Despite having the least amount of growth (16%), the province's business sector expenditures remained second highest in the region ($45) in 2002.

Canada and Atlantic Canada
Notwithstanding the variability among the four provinces, it is clear that Atlantic Canada continues to draw more heavily on public sources, specifically the federal government and higher education sectors, than Canada as a whole. In 2002, per capita expenditures were fairly equal in the Maritime provinces and Atlantic Canada; however, Newfoundland and Labrador had outpaced Maritime growth in two of the main sectors (federal government and higher education) between 1995 and 2002.

Overall, the growth in HERD per capita in Atlantic Canada is significant considering the make-up of the region's post-secondary system. Given the region's concentration on undergraduate education (80% of its universities are primarily undergraduate) and its relatively low proportion of graduate student enrolments (7%), particularly at the doctoral level (4%), the level of per capita R&D investment by Atlantic Canada's universities is substantial, reflecting not only the universities' commitment to R&D but also the region's heavy reliance on this sector despite its primarily undergraduate composition.

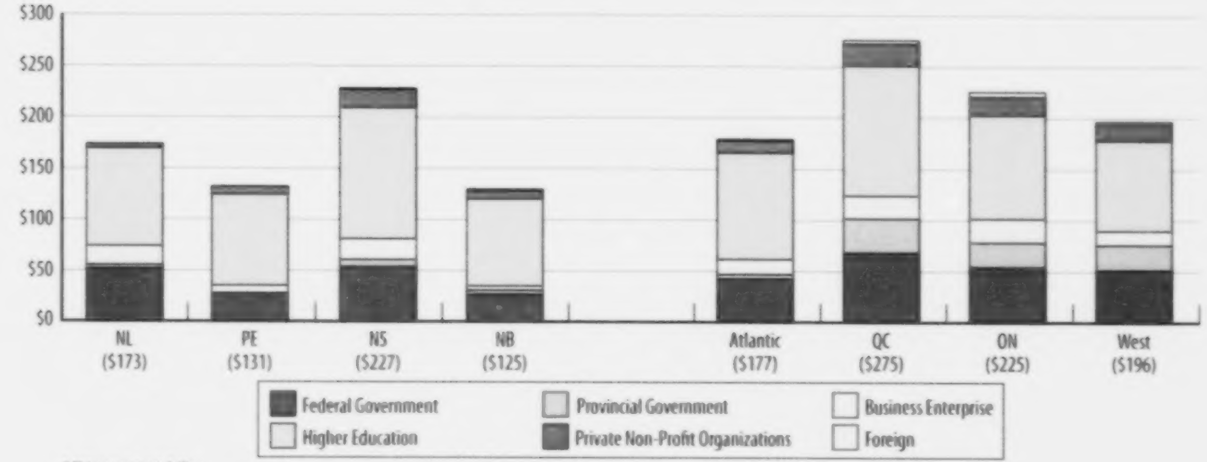
2.4 R&D Expenditures in the Higher Education Sector

R&D Expenditures in the Higher Education Sector—Regional and Provincial Distributions

Clearly, the higher education sector is a key R&D player in Canada—and the main player in Atlantic Canada. In the following section, R&D expenditures within the higher education sector are examined in greater detail.

As was the case in 1996, in 2002, the higher education system itself, followed by the federal government, was the primary investor in higher education research, accounting for close to half of the total expenditures reported for each Canadian region. In Atlantic Canada, this proportion was approximately ten points higher (59%) than other regions with most of the variation due to lower levels of expenditures in the provincial government sector than found elsewhere in the country (3% in Atlantic Canada, 11-13% in every other region). As shown in Figure 2.10, on a per capita basis, expenditures in Canada's higher education sector were lowest in Atlantic Canada ($177) with Nova Scotia ($227) and Newfoundland and Labrador ($173) reporting the highest Atlantic levels (in this capacity, Nova Scotia showed considerable R&D investment as its per capita expenditures were higher than three of the four Canadian regions).

Figure 2.10
Distribution of Per Capita R&D Expenditures in the Higher Education Sector by Sector, Region and Atlantic Province, 2002



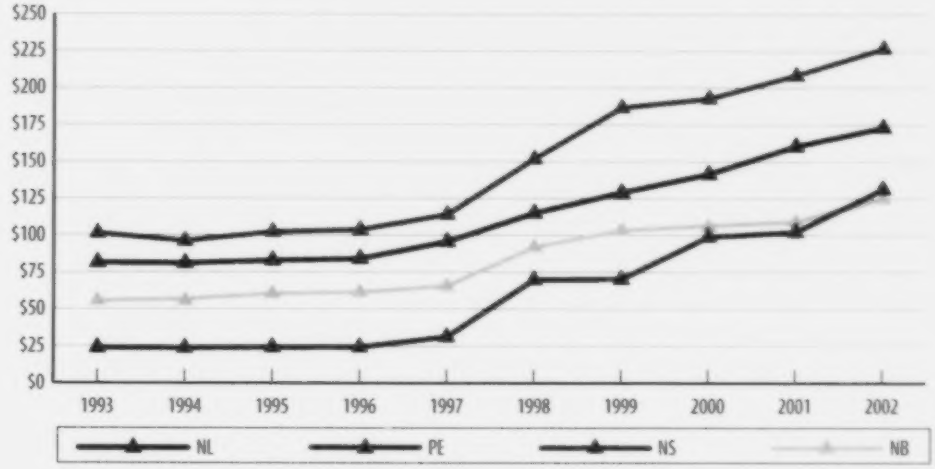
* Using constant dollars.

** The National Capital Region and the Territories did not report expenditures in the Higher Education Sector.

Source: Statistics Canada—GERD, Canada, 1993 to 2004 and by Province, 1993 to 2002;
Statistics Canada—Demography Division (www.gnb.ca/0160/Economics/PopulationCanadaProvinces1.htm); author's calculations.

In spite of low expenditure levels within the varying sectors, Figure 2.11 shows that, since 1997, there has been considerable growth in per capita expenditures for higher education research in Atlantic Canada. As was highlighted in Figure 2.10, Nova Scotia's per capita expenditures were the highest in Atlantic Canada and, in fact, throughout the period, expenditures in this province were at par or above the national average.

Figure 2.11
Per Capita R&D Expenditures in Atlantic Canada's Higher Education Sector, 1993 to 2002



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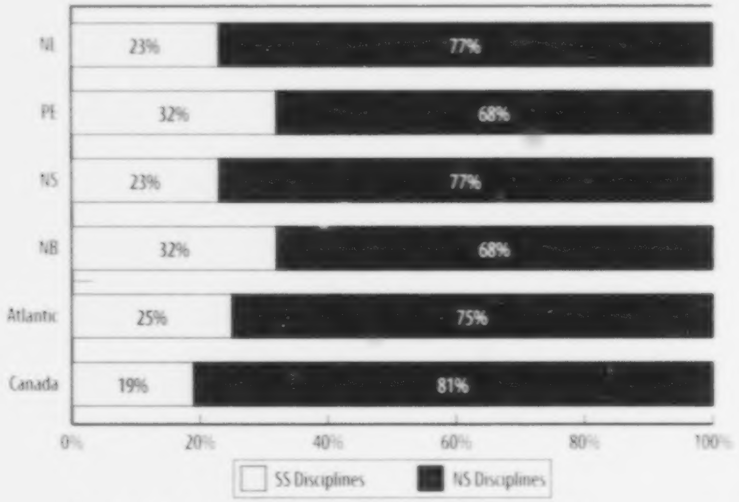
The Impact of Disciplinary Focus: Natural Sciences (NS) and Social Sciences (SS)

As was the case in 1996, per capita expenditures in the higher education sector were lower in the Atlantic provinces than elsewhere in the country (as shown in Figure 2.10). Figures 2.12 and 2.13 present these differences from a different perspective showing per capita funding by discipline to see what impacts differences in disciplinary focus might have on expenditures within each Atlantic province and for Canada as a whole. Per capita expenditures within two discipline areas,[38] natural sciences and social sciences, are examined.

In the higher education sector, expenditures were concentrated in the natural sciences disciplines for Atlantic Canada and for Canada as a whole. While this is to be expected given the higher costs of conducting research in the natural sciences,[39] Figure 2.12 shows that expenditures in Atlantic Canada differed from Canada as a whole as the social sciences accounted for proportionately more expenditures in this region than at the national level.

Figure 2.12
Proportion of R&D Expenditures by Discipline, Canada and Atlantic Canada, 2002



Source: Statistics Canada—GERD, Canada, 1993 to 2004 and by Province, 1993 to 2002; author's calculations.

New Brunswick and Prince Edward Island had the highest (and equal) proportion of expenditures concentrated in social science disciplines (32%) with both provinces spending approximately $40 per capita on social science research. Newfoundland and Labrador also spent $40 per capita, however, as a proportion of the province's total, this amount was lower, at 23%. Nova Scotia's proportion of expenditures in the social sciences were at par with Newfoundland and Labrador (23%) with actual funding amounts the highest in the region ($55 per capita) and even higher than at the national level ($43 per capita). For Canada as a whole, 19% of total R&D expenditures were directed toward the social sciences.

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[38] As found in the Statistics Canada publication, *Estimates of Canadian Research and Development Expenditures (GERD), Canada, 1993 to 2004, and by Province 1993 to 2002.*

[39] It should be noted that within this context, health research is included in this category.

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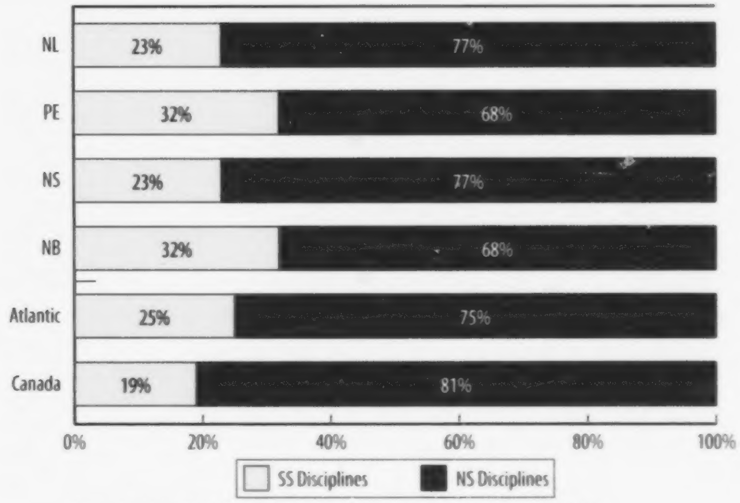

Source: Statistics Canada—GERD, Canada, 1993 to 2004 and by Province, 1993 to 2002; author's calculations.

New Brunswick and Prince Edward Island had the highest (and equal) proportion of expenditures concentrated in social science disciplines (32%) with both provinces spending approximately $40 per capita on social science research. Newfoundland and Labrador also spent $40 per capita, however, as a proportion of the province's total, this amount was lower, at 23%. Nova Scotia's proportion of expenditures in the social sciences were at par with Newfoundland and Labrador (23%) with actual funding amounts the highest in the region ($55 per capita) and even higher than at the national level ($43 per capita). For Canada as a whole, 19% of total R&D expenditures were directed toward the social sciences.

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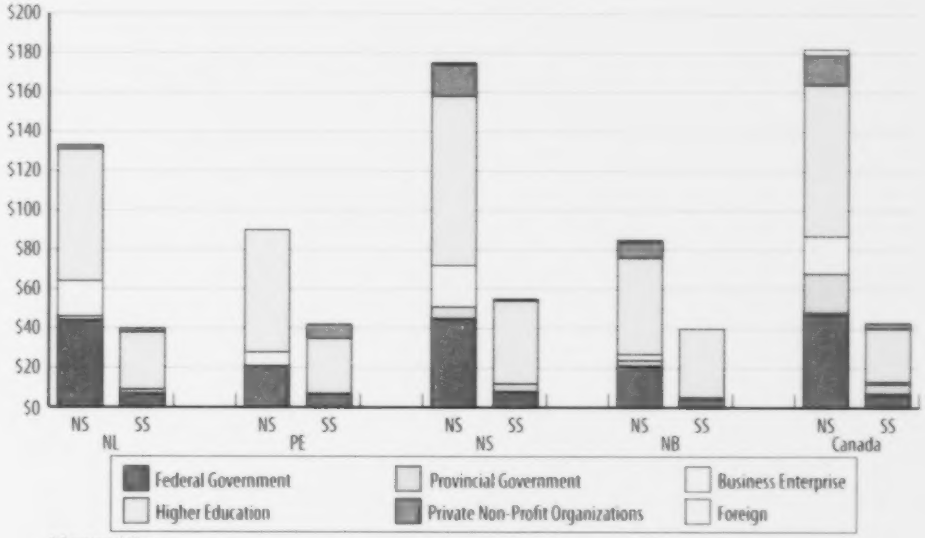
[38] As found in the Statistics Canada publication, *Estimates of Canadian Research and Development Expenditures (GERD), Canada, 1993 to 2004, and by Province 1993 to 2002.*

[39] It should be noted that within this context, health research is included in this category.

If faculty and enrolment distributions were more heavily concentrated in the social sciences in Atlantic Canada than at the national level, one would expect to see proportionately more expenditures in social science research in this region, but this was not the case (as shown in Chapter 1, distributions by discpline were similar across regions). Instead, the larger concentration of expenditures in the social sciences could be the result of any number (or a combination) of factors. One such factor could be the types of institutions located in the region. As shown later in this report, primarily undergraduate universities account for a larger proportion of sponsored research income given by the Social Sciences and Humanities Research Council (SSHRC) than any other granting agency—a large number of these institutions are located in Atlantic Canada. A second component, explored in detail in the following chapters, could be the design of funding programs that support university R&D. New federal funding initiatives focus heavily on the natural science (and health) disciplines. Given the national-level use of such funding programs, and Atlantic Canada's relatively lower level of use (as shown in this chapter and in the following chapters), an increase in expenditures in the natural sciences without the same increase in the social sciences (that would have resulted in roughly the same proportions evident in 1995), is understandable.

The following graph (Figure 2.13) presents R&D expenditures in the higher education sector in more detail. It shows the distribution of expenditures within each discipline group, by sector, for each Atlantic province, and Canada as a whole.

Figure 2.13
Distribution of R&D Expenditures in the Higher Education Sector by Discipline (Natural Sciences and Social Sciences) and Funding Sector, Canada and Atlantic Canada, 2002



* Constant dollars.
Source: Statistics Canada—GERD, Canada, 1993 to 2004, and by Province, 1993 to 2002;
Statistics Canada—Demography Division (www.gnb.ca/0160/Economics/PopulationCanadaProvinces1.htm); author's calculations.

Funding Sectors within the Natural Sciences

Figure 2.13 shows that per capita R&D expenditures in the natural sciences were greater for Canada as a whole ($181) than any Atlantic province. Nova Scotia ($175) and Newfoundland and Labrador ($133) were closest to the national level, while Prince Edward Island ($90) and New Brunswick ($84) were noticeably lower. In each Atlantic province, and nationally, the federal government was the second largest funding sector (as noted earlier, the higher education sector itself was the largest), with remaining sources differing by province.

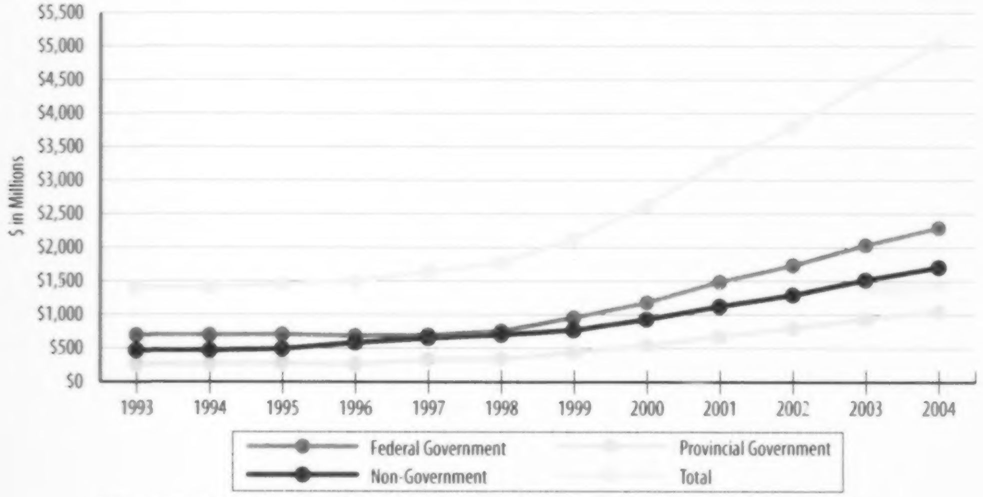
Funding Sectors within the Social Sciences

In the social sciences, funding distributions were quite different. First, Atlantic Canada ($46) reported a greater per capita investment than Canada as a whole ($43). Second, potential sources of funding for research in this group of disciplines were more limited than for research in the natural sciences as there were no foreign expenditures reported across Canada, leaving only five possible sources for each province. These five sources decreased to four in Atlantic Canada as there were no business sector expenditures reported for social sciences research in this region.[40] Nationally, the higher education sector was by far the major source of expenditures in social science R&D accounting for nearly two thirds (63% or 27/43) of the total. This sector was even more important to Atlantic R&D where expenditure percentages ranged from 67% in Prince Edward Island to 88% in New Brunswick. As was the case with funding for the natural sciences, the federal government was the next highest contributor to research in the social sciences, with minimal per capita expenditures reported for the remaining sources.

External Funding of Post-Secondary Research

Factoring out expenditures by the higher education system itself, Figure 2.14 shows that after remaining steady in the earlier part of the decade, external funding of Canadian university research has grown considerably in the last several years. Excluding the higher education sector, in 2004, the federal government was the largest supporter of university research, accounting for 45% of total funds. Non-government sources, including business enterprise, private non-profit organizations and foreign sectors, were the second highest contributors with 34%, while provincial governments represented approximately 21% of total funding.

Figure 2.14
External Sources of R&D Funding in the Higher Education Sector, 1993 to 2004



* Using constant dollars.
Source: Statistics Canada—GERD, Canada, 1993 to 2004, and by Province, 1993 to 2002;
Statistics Canada—Demography Division (www.gnb.ca/0160/Economics/PopulationCanadaProvinces1.htm); author's calculations.

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[40] For Canada as a whole, each of the five possible sources invested some money, however, business sector investment was also minimal ($1 per capita).

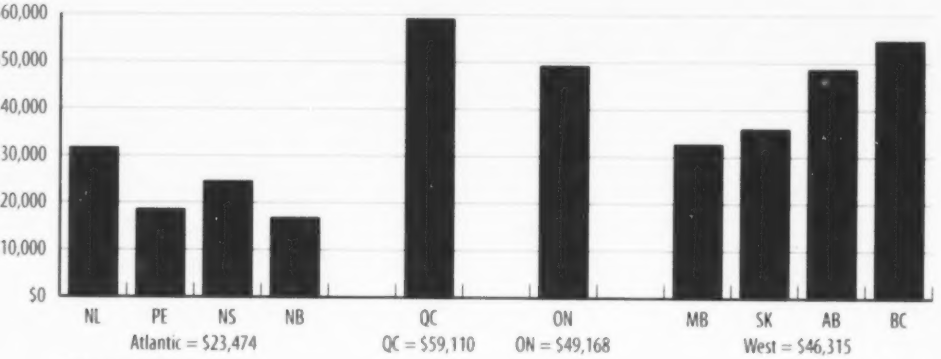
Given the fact that the federal government has taken a key role as the funder and director of Canadian R&D (as evident in the development of its Innovation Strategy), it is not surprising to see that external funding comes largely from this source. The following section looks at this source of funding in more detail.

Federal Investment in Higher Education Research—Types of Programs and Distribution

Recognizing that much of the federal funding universities receive for research is awarded to its faculty, the following figures show these expenditures in relation to full-time faculty, positioning Atlantic Canadian expenditures within the national context.

In 2002, federal government expenditures per full-time faculty member were lowest in Atlantic Canada (Figure 2.15) at half the amount received by the next lowest region (Atlantic Canada = $23,474; West = $46,315). On a provincial level, each Atlantic province had the lowest amounts in Canada, with Newfoundland and Labrador ($31,574) better positioned than its Maritime counterparts and nearing the expenditures of Manitoba ($32,644) and Saskatchewan ($35,928). In order to understand these regional (and provincial) differences, it is important to look more closely at federal government expenditures for university-sponsored research.

Figure 2.15
Distribution of Federal R&D Expenditures in the Higher Education Sector, Per Full-time Faculty by Province, 2002



* Using constant dollars.
Source: Statistics Canada—GERD, Canada, 1993 to 2004, and by Province, 1993 to 2002; Statistics Canada—University and College Academic Staff Survey; author's calculations.

Of the nearly two billion dollars universities received from the federal government for sponsored research, more than half (58%) was committed by the three granting councils.[41] In the Commission's previous report on post-secondary research (August 2000), it was noted that there was a significant difference in programme distribution between Canada as a whole and Atlantic Canada. Nationally, granting councils had been the most significant source of research revenues, but in Atlantic Canada, federal departments provided the most funding. This difference suggested that Atlantic Canada did better in terms of department programmes than in researcher-generated proposals.

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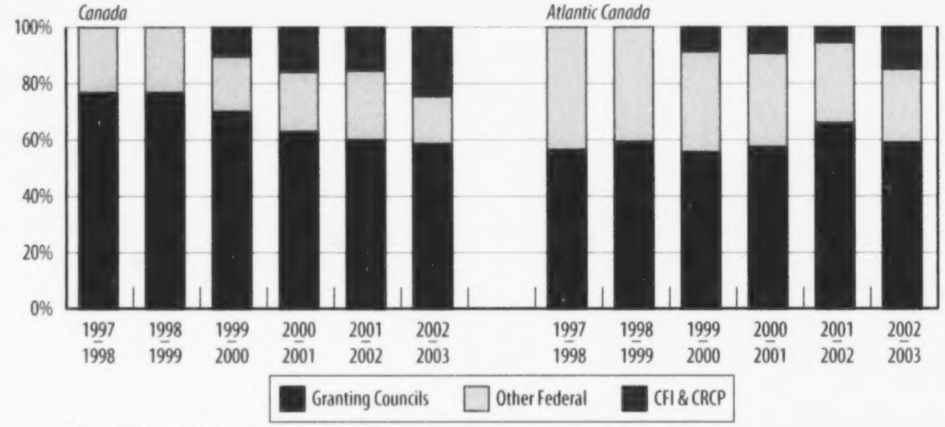
[41] Refer to Appendix A for a caveat concerning data from the Canadian Association of University Business Officers (CAUBO).

Figure 2.16 shows that federal government funding received by universities changed between 1997-1998 and 2002-2003. By 2002-2003, they accounted for roughly equal proportions of federal government funding in Atlantic Canada as for Canada as a whole. However, it would not be accurate to presume that this similarity was a result of considerable changes in Atlantic Canada's granting council income; instead, new sources of federal government income appear to be the cause of this shift. In 2002-2003, the Canada Research Chairs program (CRCP) and the Canada Foundation for Innovation (CFI) were contributing to Canadian universities and the presence of these funding sources altered regional proportions. For Canada as a whole, the granting councils accounted for 58% of sponsored research income, the CRCP and CFI, 25%, and other programmes, 17%. In Atlantic Canada, the proportion of granting council income reached the Canadian level (59%), with roughly the same percentages for remaining sources but in the reverse order (CFI & CRCP = 15%; Other programmes = 26%). Therefore, Canada increasingly drew more upon the newest initiatives, and as such changed their granting council proportions, while Atlantic Canada appears to have continued doing better in terms of department programmes than in researcher-generated (and possibly "institution-generated")[42] proposals.

Figure 2.16
Federal Research Revenues Received by Universities by Source, Canada and Atlantic Canada, 1997-1998 to 2002-2003



Souce: CAUBO; author's calculations.

2.5 The Context for Investment and Change in Atlantic Canada

Atlantic Canada is taking steps to support and actively participate in the federal government's Innovation Strategy. These steps, such as the development of region-specific funding and province-specific innovation plans discussed in Chapter 5, have in turn increased the total dollar amounts invested in research in Atlantic Canada and in the region's PSE sector in particular. This has led to some stellar R&D advancements (new research projects, Canada Research Chairs, regional and national partnerships) which are noted in a later section of the report.

Despite these advances, growth in investment on a per capita basis was limited as the Atlantic provinces continued to have the lowest level of funding in the country in 2002.

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[42] For the CFI, the institution submits an application for funding under certain mechanisms; for the CRCP, the university submits a Canada Research Chair nomination. Each of these programs is addressed in greater detail in Chapter 4.

It is clear from the data presented earlier that Atlantic Canada's knowledge and innovation capacity is structured in a significantly different way, in terms of its major components, than the country as a whole. Whereas business R&D expenditures accounted for the largest portion (55%) of research activity nationally, this sector accounted for 16% of the total in Atlantic Canada in the same year. Further, while the business sector has been involved in some collaborative R&D in Atlantic Canada (as shown in Appendix C), the sector is still largely characterized by small-to-medium size businesses which have limited ability to initiate or participate in R&D activity. Success in including business enterprise continues to be limited, a situation not likely to change unless a considerable shift takes place.

With limited business sector involvement, Atlantic Canada's higher education sector has taken on an even more important role in R&D than it had in 1995 (the sector's proportion of R&D expenditures was 14% more by performing sector and 9% more by funding sector).[43] Further still, in Atlantic Canada the higher education sector spent slightly more per capita ($105) than at the national level ($104)—a noteworthy shift since 1995 (Atlantic=$47, Canada=$55).

The following chapters focus specifically on government funding of university R&D and again examine Atlantic Canada's place within the evolution of R&D funding in Canada.

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[43] Atlantic Canada: Performing sector—1995=45%, 2002=59%; Funding sector—1995=26%, 2002=35%. Canada: Performing sector—1995=27%, 2002=33%; Funding Sector—1995=14%, 2002=15%.

Chapter 3—*The Federal Research Funding Environment: The Granting Councils*

findings

- At the national level, total granting council income increased significantly (107%) from approximately $516 million in 1997-1998 to $1 billion in 2002-2003. While each granting council showed considerable growth (NSERC=68%, SSHRC=139%), the MRC/CIHR increased the most (160% from $184 million in 1997-1998 to $480 million in 2002-2003), reflecting the prioritization of health research and the broader mandate of the CIHR, which replaced the MRC in 2000.

- Following the national trend, Atlantic Canadian universities also more than doubled (115%) their total granting council income (1997-1998=$28 million; 2002-2003=$61 million) thus maintaining their proportion (6%) of the national total.

- Growth in Atlantic Canada's SSHRC income (260%) far outpaced that of either NSERC (84%) or MRC/CIHR (177%), resulting in a two-point increase in its proportion of the national total (1997-1998=5%, 2002-2003=7%).

- In 2002-2003, NSERC was Atlantic Canada's greatest source of granting council income ($38 million), at more than twice that of either SSHRC ($7 million) or the CIHR ($15 million).

- Given the distributions of granting council funding at the national level, it is clear that the health sector is particularly problematic for Atlantic Canada. Despite the region's relatively equal proportions (with other Canadian regions) of faculty and enrolments in the health fields, the region's proportion of MRC/CIHR funding was the lowest of the three granting councils at 3% of the national total.

Granting Council Funding in Atlantic Canada

	Granting Council Income ($ In Millions*)		Proportion of National Total (%)	
	1997-1998	2002-2003	1997-1998	2002-2003
NSERC	21	38	7	8
SSHRC	2	7	5	7
MRC/CIHR	6	15	3	3
Total	28	61	6	6

*Constant dollars; totals may not add due to rounding.

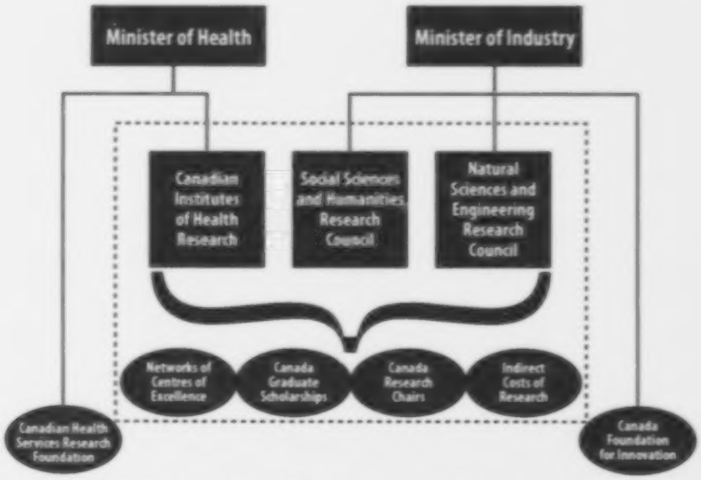
3.1 Federal Government Funding of R&D

As noted in the statistical analysis in Chapter 2, there are vast differences across the country in research activity and funding. More specifically, in Atlantic Canada: (a) the higher education and government sectors are more important R&D contributors than in the country as a whole; (b) industry is a relatively minor contributor (consisting as it does of primarily small-to-medium size enterprises); and (c) as it stands, the business sector does not appear to be a viable core for intensifying regional R&D.

Attempts to take some of these differences into account are apparent in many of the federal programs discussed in this and the following chapter. However, when looking at these programs individually it can sometimes be difficult to see the bigger picture. A view from the top is needed in order to situate the evolution of Atlantic Canada's post-secondary research environment within the evolution of the federal government's research funding environment in general.

The Social Sciences and Humanities Research Council (SSHRC) has taken this same type of approach in recent reviews of its programs relative to those of other granting councils. In 2004 the document highlighting "Background facts for the consultation on SSHRC's transformation," SSHRC produced an eminently useful diagram outlining the federal research and research infrastructure environment in Canada. This diagram outlines several major sources of federal funding available in Canada and the relationships between these initiatives. It should be noted, however, that the diagram does not take into account investments made by the federal government through its line departments and agencies, R&D institutions (such as the National Research Council) or regional development agencies (such as the Atlantic Canada Opportunities Agency (ACOA)). In Chapter 2, line department funding was examined briefly in terms of federal funding percentages; however, due to the limited availability of data for this measure a detailed analysis is beyond the scope of this report. A brief description of Canada's regional development agencies is provided in Chapter 5 along with a detailed analysis of the Atlantic Innovation Fund (AIF), a regional program administered by ACOA and designed specifically to enhance R&D, and particularly the commercialization of R&D, in the Atlantic region.

Figure 3.1
Federal Government Funding of Research and Research Infrastructure in Canada


Minister of Health
Minister of Industry
Canadian Institutes of Health Research
Social Sciences and Humanities Research Council
Natural Sciences and Engineering Research Council
Networks of Centres of Excellence
Canada Graduate Scholarships
Canada Research Chairs
Indirect Costs of Research
Canadian Health Services Research Foundation
Canada Foundation for Innovation

Source: Social Sciences and Humanities Research Council. (2004). "Background facts for the consultation on SSHRC's transformation." *From Granting Council to Knowledge Council: Renewing the Social Sciences and Humanities in Canada, Volume 2.*

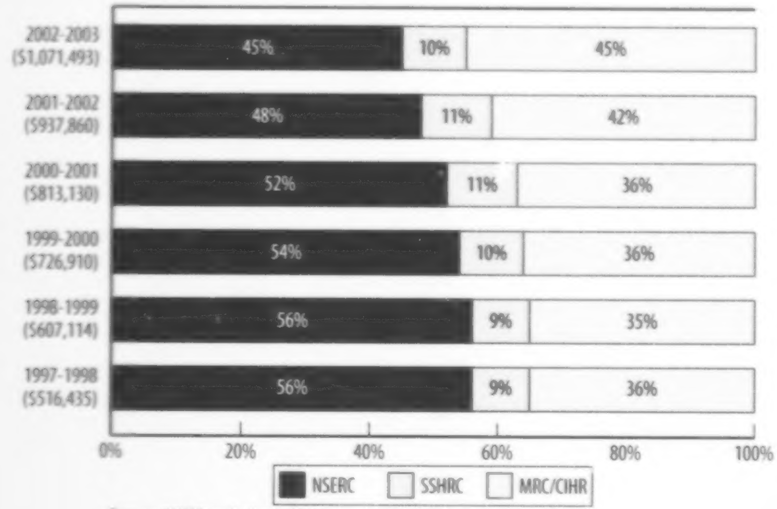
This chapter examines the core component of the federal research funding environment, the granting councils, with detailed analyses of some of the newest federal initiatives presented in Chapter 4.

The Granting Councils

The most important federal research funding mechanisms are, undoubtedly, the three granting councils. In 2002-2003, universities received more than one billion dollars from the three granting councils: the Natural Sciences and Engineering Research Council (NSERC), the Social Sciences and Humanities Research Council (SSHRC) and the Canadian Institutes of Health Research (CIHR). Of this, 6% (approximately $61 million)[44] was awarded to Atlantic universities. As presented in Figure 3.2, NSERC and CIHR were the major players, accounting for 90% of the Canadian total. Although this distribution is likely implemented to compensate for the high costs of conducting NSERC and CIHR-related research, it is also likely that this distribution is partially reflective of the federal government's prioritization of "big science" and "big health" research, as these areas of study are more recognizable as sources of potential commercialization.

It should be noted that after having remained steady at 35-36% of the total, the proportion of MRC/CIHR income increased six points (42%) between 1997-1998 and 2001-2002, then an additional three points in 2002-2003 (45%), bringing it at par with the NSERC granting council proportion. This shift in distribution supports the recent funding restructure (as described in section 3.4) for health and health-related research. The following subsections deal in greater detail with each granting council.

Figure 3.2
Distribution of Granting Council Funding in Canada, 1997-1998 to 2002-2003



Source: CAUBO; author's calculations.

3.2 Natural Sciences and Engineering Research Council of Canada (NSERC)[45]

The *Natural Sciences and Engineering Research Council*, now also known as *Science and Engineering Research Canada* or *NSERC*, was established in 1978 in response to growing concerns that a single

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[44] Constant dollars.

[45] www.nserc.gc.ca

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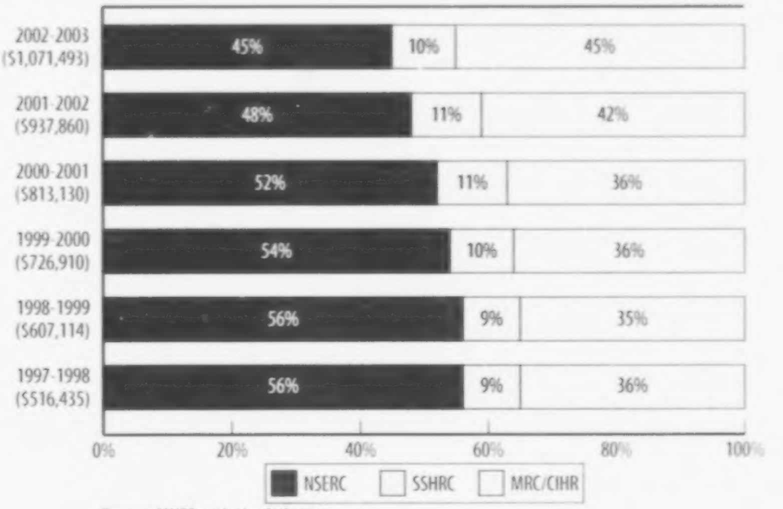

Source: CAUBO; author's calculations.

3.2 Natural Sciences and Engineering Research Council of Canada (NSERC)[45]

The *Natural Sciences and Engineering Research Council*, now also known as *Science and Engineering Research Canada* or *NSERC*, was established in 1978 in response to growing concerns that a single federal agency, the National Research Council (NRC), was responsible for both performing and supporting research and as such, the process of awarding funding was open to potential conflicts of interest. To combat the centralization of both the performance and support of Canadian research, a Bill was put forth to relieve the National Research Council of its responsibility for awarding research funding, and to create separate research funding agencies (the Natural Sciences Engineering Research Council and the Social Sciences and Humanities Research Council) to assume this function.

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[44] Constant dollars.

[45] www.nserc.gc.ca

In 1978, this transfer came to fruition as the Natural Sciences and Engineering Research Council was created "to promote and assist research in the natural sciences and engineering, and to advise the minister about matters relating to such research."

Since then, NSERC has grown substantially and, according to its *Report on Plans and Priorities, 2005-2006*, today supports research in natural sciences and engineering through a multitude of programs which are organized under three main strategic outcomes:

Strategic Outcome #1: Highly skilled science and engineering professionals in Canada
- *Promote science and engineering* through programs such as PromoScience and Centres for Research in Youth, Science Teaching and Learning (CRYSTALs)
- *Support students and fellows* through Undergraduate Student Research Awards, NSERC Postgraduate Scholarships, Canada Graduate Scholarships, Postdoctoral Fellowships and Industrial Research Fellowships
- *Attract and retain faculty* through incentives such as Research Chairs through the Canada Research Chairs and Industrial Chairs programs

Strategic Outcome #2: High quality Canadian-based competitive research in the NSE
- *Fund basic research* through Discovery Grants, Special Research Opportunity Grants, Research Capacity Development in Small Universities and the like
- *Fund research in strategic areas* through Strategic Projects Grants and Collaborative Health Research Projects

Strategic Outcome #3: Productive use of new knowledge in the NSE
- *Fund university-industry-government partnerships* through Collaborative Research and Development Grants, Research Partnerships Agreements, and Research Networks
- *Support commercialization* through programs such as the Idea to Innovation Program and Intellectual Property Mobilization

For the 2005-2006 fiscal year, NSERC has at its disposal approximately $865 million, making it the highest funded of the three granting councils.

It should also be noted that as part of its vision to "help make Canada a country of discoverers and innovators for the benefit of all Canadians," NSERC opened, in October 2004, its first of five planned regional offices. While an important step for the Council as a whole, this is an important step for Atlantic Canada's R&D community as this first office is located in Moncton, New Brunswick. The remaining offices are expected to be set up in British Columbia, the Prairies, Ontario and Québec.

Funding and Distribution Trends—Canada and Atlantic Canada[46]

Notwithstanding the substantial increase in CIHR proportion as noted above, NSERC received significant injections of new funding since the previous report's release with the national total growing 68% between 1997–1998 and 2002–2003. As Table 3.1 demonstrates, Atlantic universities received, on average, 7% of these NSERC awards (the same percentage found in the original report's comparison of 1993–1994 to 1997–1998). By 2001–2002, this proportion had increased to 8%. Given the annual increases in funding at the national level, this proportion represents a significant amount of funding as the region moved from just under $21 million in 1997–1998 to more than $38 million (84% growth) in 2002–2003. As one might expect given its size, almost half of Atlantic revenues were received by Nova Scotia universities, although the range varied somewhat over the reference period (low = 44% of the Atlantic total, or $13 million, in 2000–2001; high = 52% of the Atlantic total, or $19 million, in 2002–2003).

Table 3.1
NSERC Revenues Received by Canadian Universities, by Province,
1997–1998 to 2002–2003 ($000)

	1997-1998	1998-1999	1999-2000	2000-2001	2001-2002	2002-2003
NL	5,054	6,163	9,138	10,130	9,995	10,167
PE	399	704	519	1,026	1,167	1,183
NS	10,507	10,000	13,331	13,058	18,260	19,404
NB	4,828	5,475	5,959	5,650	5,501	7,569
QC	71,449	92,989	107,203	112,052	123,874	122,936
ON	104,281	125,893	141,457	156,999	153,751	178,321
MB	7,889	7,619	8,455	13,387	12,460	14,537
SK	8,559	10,553	11,874	13,242	11,715	14,367
AB	33,071	35,022	44,046	48,257	50,887	54,837
BC	40,724	45,447	50,339	50,285	61,358	58,969
Maritime Total	15,734	16,179	19,809	19,734	24,928	28,155
Atlantic Total	20,788	22,341	28,947	29,865	34,923	38,322
Canada Total	286,760	339,865	392,322	424,085	448,968	482,289
Maritime Percentage	5%	5%	5%	5%	6%	6%
Atlantic Percentage	7%	7%	7%	7%	8%	8%

* Constant dollars.
Source: CAUBO, Report 2.1A; author's calculations.

Table 3.2 shows that Dalhousie University (Dal) once again received the most funding in Atlantic Canada while Memorial University (MUN) and the University of New Brunswick (UNB) remained the other top awarded institutions. As was the case in the previous report, these three universities accounted for more than 80% of Atlantic university NSERC revenues.

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[46] Prior to publication, MPHEC learned that data for the 2001-2002 fiscal year were mis-classified by the University of Prince Edward Island (UPEI) when reporting to CAUBO. The NSERC total for this province was actually $945,509 ($879,891 in constant dollars) and as such, data should be interpreted with caution.

Table 3.2
Distribution of NSERC Revenues Received by Atlantic Canadian Universities, 1997–1998 to 2002–2003 ($000)

	1997-1998	1998-1999	1999-2000	2000-2001	2001-2002	2002-2003
MUN	5,054	6,163	9,138	10,130	9,995	10,167
UPEI	399	704	519	1,026	1,167	1,183
Acad	578	759	713	680	834	903
CBU	36	123	53	122	93	108
Dal	8,048	7,252	10,352	9,727	14,613	15,362
MSVU	54	52	95	108	19	40
NSAC	467	353	330	442	489	519
SFXU	802	759	1,110	1,186	1,401	1,534
SMU	522	702	677	794	811	939
MTA	378	445	406	554	594	532
UdeM	506	477	552	554	670	720
UNB	3,944	4,553	5,001	4,542	4,237	6,317
Total	20,788	22,341	28,947	29,865	34,923	38,322

* Constant dollars.
Source: CAUBO, Report 3.1; author's calculations.

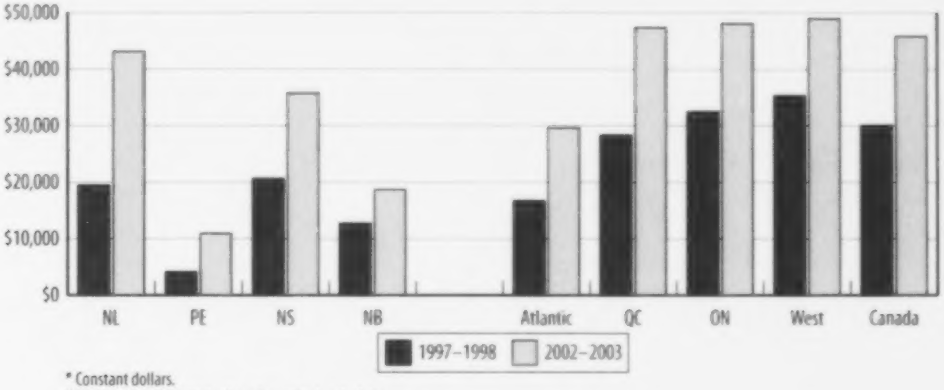
Funding and Distribution Trends by Full-time Faculty—Canada and Atlantic Canada

While total funding amounts are important to consider, funding per full-time faculty can be a more meaningful measure as these data better reflect the distribution of NSERC funding received by its primary applicants. From this perspective, between 1997–1998 and 2002–2003, Atlantic Canada's NSERC income grew considerably (77%); however, despite having the highest level of growth by region, in 2002–2003, Atlantic Canada received just under $30,000 per FTF whereas Canada as a whole and each of the other regions received between $46,000 and $49,000 per full-time faculty for this same fiscal year (Figure 3.3).

Looking more closely at the Atlantic provinces, it is clear that by 2002–2003 Newfoundland and Labrador was quite different from the Maritime provinces. Whereas in 1997–1998, Nova Scotia had the highest funding per full-time faculty in the Atlantic provinces ($20,642), it did not keep pace with growth in Newfoundland and Labrador. By 2002–2003, Newfoundland and Labrador had more than doubled its NSERC funding, reaching more than $43,000 per full-time faculty and nearing the funding amounts in Québec ($47,338), Ontario ($48,039) and the West ($48,957).

The Maritime provinces, on the other hand, experienced considerably different income and growth levels. Nova Scotia's NSERC income increased 73% between 1997–1998 and 2002–2003 bringing it to just under $36,000. Prince Edward Island, the lowest NSERC-funded province on a full-time faculty basis, reported the largest growth rate with an increase of 163%. New Brunswick reported the smallest growth (47%) for the same period; however, in 2002–2003, New Brunswick funding remained considerably higher than Prince Edward Island (PE = $10,950; NB = $18,688).

Figure 3.3
NSERC Revenues Received per Full-time Faculty in the Natural Sciences and Engineering Disciplines by Region and Atlantic Province, 1997–1998 and 2002–2003

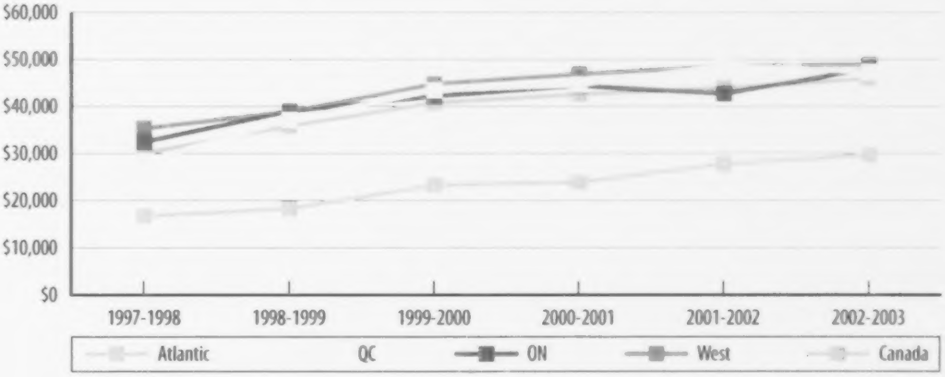


* Constant dollars.
Source: CAUBO; Statistics Canada; author's calculations.

The graphs that follow present a closer look at Atlantic Canada's NSERC awards, per FTF, within the national context.

As noted above, on a full-time faculty member basis, Atlantic Canada's NSERC income increased the most of any region between 1997–1998 and 2002–2003. Despite this level of growth, however, Figure 3.4 shows that the sizeable funding gap evident in 1997–1998 and the relatively steady increases in NSERC income for all regions, has resulted in continuation of a disparity in the amount of funding received by universities in Atlantic Canada and those located in other regions.

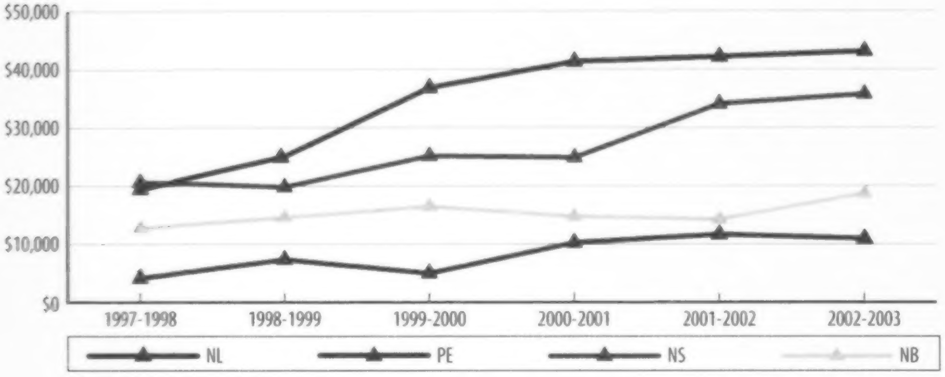
Figure 3.4
NSERC Revenues Received per Full-time Faculty in Natural Sciences and Engineering Disciplines by Region, 1997–1998 to 2002–2003



*Constant dollars.
Source: CAUBO; Statistics Canada; author's calculations.

Within the Atlantic provinces, Newfoundland and Labrador was the most outstanding in terms of NSERC funding growth, increasing significantly between 1998–1999 and 2000–2001 (Figure 3.5). Nova Scotia, while slightly higher than Newfoundland and Labrador in 1997–1998, lost considerable ground until 2000–2001 when it then spiked to nearly $35,000 and became closer positioned to the highest-funded Atlantic province. New Brunswick showed minimal gains in funding until 1999–2000 when it then began a decline at approximately the same rate as previous years' increases. In 2001–2002, New Brunswick's NSERC income was at approximately the same level it had been in 1997–1998; however, a boost in 2002–2003 put New Brunswick levels at their highest in at least six years, with just under $19,000 per full-time faculty member. In Prince Edward Island, fluctuations were apparent with somewhat of a leveling-off in the latter years of the observed time frame.[47]

Figure 3.5
NSERC Revenues Received per Full-time Faculty in Natural Sciences and Engineering Disciplines by Atlantic Province, 1997–1998 to 2002–2003



* Constant dollars.
Source: CAUBO; Statistics Canada; author's calculations.

Funding and Distribution Trends by University Type

While funding totals by province (Table 3.1) do not exactly match funding by university type (Table 3.3) due to the limited number of universities included in any analyses by university type,[48] an examination of funding in this regard is useful as it provides a general idea of where granting council funding is concentrated. This same analysis is found in sections of this chapter dealing with the Social Sciences and Humanities Research Council (SSHRC) and Canadian Institutes of Health Research (CIHR).

Nationally, as illustrated in Table 3.3, more than $450 million was provided to categorized universities in 2002–2003; of that, more than two-thirds went to medical-doctoral universities ($317 million). Comprehensive universities accounted for one quarter of NSERC funding ($112 million) while primarily undergraduate universities received the remaining 5% ($22 million).

Medical-doctoral universities received an average of nearly $13 million in NSERC funding in 1997–1998. This figure grew nearly 70% to over $21 million by 2002–2003. Comprehensive universities also experienced a sizeable increase (63%), from more than $6 million in 1997–1998 to just over $10 million in 2002–2003. Growth in primarily undergraduate universities (105%) outpaced both university types, increasing from just under half a million dollars ($414,000) in 1997–1998 to almost one million dollars ($848,000) in 2002–2003.

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[47] Although this leveling-off is less visible when substituting the revised 2001-2002 figure provided by UPEI ($8,799 per full-time faculty in the NSE disciplines).

[48] See Appendix A.

Table 3.3
NSERC Revenues Received by Canadian Universities by Type, 1997–1998 to 2002–2003 ($000)

	1997–1998	1998–1999	1999–2000	2000–2001	2001–2002	2002–2003
Medical-Doctoral	187,844	231,653	264,792	285,899	295,101	316,569
Average	*12,523*	*15,444*	*17,653*	*19,060*	*19,673*	*21,105*
Comprehensive	68,765	74,817	88,785	97,080	101,428	112,077
Average	*6,251*	*6,802*	*8,071*	*8,825*	*9,221*	*10,189*
Primarily Undergraduate	10,761	11,930	14,380	16,483	20,074	22,048
Average	*414*	*459*	*553*	*634*	*772*	*848*
Total	267,371	318,400	367,957	399,462	416,603	450,694

* Constant dollars.
Source: CAUBO, Report 3.1; author's calculations.

3.3 Social Sciences and Humanities Research Council of Canada (SSHRC)[49]

The Social Sciences and Humanities Research Council (SSHRC) was created, in 1977, "as an arm's-length federal agency that promotes and supports university-based research and training in the social sciences and humanities." SSHRC does this through a variety of programs that support:

- research training for master's and doctoral students and post-doctoral researchers;
- investigator-framed research in all areas that the Council supports, including social sciences, humanities, education, law, business and the environment;
- targeted research, with or without external partners, that examines contemporary issues vital to Canadians; and
- the transfer of cutting-edge knowledge to policy makers, other researchers, practitioners, and the general public.

SSHRC, on behalf of all three granting councils, also administers the Canada Research Chairs and Indirect Costs programs through the Canada Research Chairs Secretariat.

With a total 2005–2006 budget of $256.4 million for support of its programs and activities, SSHRC will support research in the social sciences and humanities through investigator-framed research (e.g., Standard Research Grants, Major Collaborative Research Initiatives) and targeted research and training initiatives such as the Initiative of the New Economy, Strategic Research Grants (e.g., Aboriginal Research, Northern Research), Strategic Joint Initiatives and Strategic Research Development (e.g., Community-University Research Alliances, SSHRC Institutional Grants, Aid to Small Universities).[50]

It should be noted that SSHRC is engaged in a process of "transformation from a granting council to a knowledge council."[51] The Council launched, in January 2004, a consultation process to seek input from its diverse stakeholder community on how it could best serve researchers, policy makers and other users of research, and Canadians in general within the context of an increasingly globalized and knowledge-based economy. In early 2005, the Council stated that "the consultation has generated deep and broad support for an expanded role for SSHRC" which includes the adoption of "interactive engagement" and "maximum knowledge impact" to the Council's foundational values. SSHRC expects to release, in Fall 2005, a new strategic plan as the penultimate step in the transformation process prior to making a formal application to Cabinet.

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[49] www.sshrc.ca

[50] This base budget includes funding for the Networks of Centres of Excellence, the Canada Graduate Scholarships and other such programs. It does not include funding for the Indirect Costs or Canada Research Chairs program.

[51] www.sshrc.ca/web/whatsnew/initiatives/transformation/documents_e.asp contains related links for the transformation process, including a three-volume series that preceded and emerged from the consultations.

Funding and Distribution Trends—Canada and Atlantic Canada

As noted in Figure 3.2, the Social Sciences and Humanities Research Council (SSHRC), comprises a relatively small share of total granting council income received by universities (9% in 1997–1998 and 10% in 2002–2003). Notwithstanding this relatively small proportion of the total, the amount of SSHRC income universities received increased substantially (139%), along with general increases in granting council funding, from just under $46 million in 1997–1998 to nearly $110 million in 2002–2003.

Table 3.4 shows that Atlantic Canada benefited from this increase as it received, in 2002–2003, nearly three times ($7 million) the amount of funding obtained in 1997–1998 ($2 million). This sizeable growth (260%) in funding is not solely attributable to national increases. Part of Atlantic Canada's growth in SSHRC income is the result of its increased proportion of total funding. Whereas in 1997–1998, the region accounted for approximately 5% of all funds disbursed, in 2002–2003 this proportion increased two points to 7% of the national total. Noticeably, SSHRC awards reached a ten-year high in Atlantic Canada in 2001–2002 (8% or nearly $8 million)—at par with the region's proportion of NSERC funding.

Table 3.4
SSHRC Revenues Received by Canadian Universities, by Province, 1997–1998 to 2002–2003 ($000)

	1997-1998	1998-1999	1999-2000	2000-2001	2001-2002	2002-2003
NL	278	220	1,035	1,266	1,600	1,237
PE	73	68	98	140	249	299
NS	1,106	1,465	2,814	3,083	4,137	4,474
NB	606	699	719	1,156	1,579	1,425
QC	14,247	19,777	23,783	30,722	29,817	35,266
ON	15,765	18,432	27,067	33,326	33,060	35,687
MB	1,150	903	2,049	2,708	2,641	3,272
SK	399	686	1,086	1,347	2,056	2,436
AB	4,384	3,520	7,432	8,489	8,105	11,019
BC	7,764	8,533	10,165	11,104	15,334	14,500
Maritime Total	1,785	2,232	3,632	4,379	5,965	6,198
Atlantic Total	2,063	2,452	4,667	5,645	7,565	7,435
Canadian Total	45,772	54,302	76,250	93,341	98,578	109,615
Maritime Percentage	4%	4%	5%	5%	6%	6%
Atlantic Percentage	5%	5%	6%	6%	8%	7%

* Constant dollars.
Source: CAUBO, Report 2.1A; author's calculations.

In contrast to the breakdown of NSERC revenues by Atlantic university (Table 3.2, which showed a prominent concentration of income received), Table 3.5 shows that SSHRC revenues were more widely disbursed in the region. On average, Dalhousie University (Dal) received the most awards with Memorial University (MUN) following closely during the latter years, but lagging behind the University of New Brunswick (UNB) in 1997–1998 and both UNB and the Université de Moncton (UdeM) in 1998–1999. In fact, all universities listed in Table 3.5 received grants in at least one year and in many cases, all years, from SSHRC. This reflects the strong social sciences and humanities capacity across Atlantic universities.

Table 3.5
Distribution of SSHRC Revenues Received by Atlantic Canadian Universities, 1997–1998 to 2002–2003 ($000)

	1997-1998	1998-1999	1999-2000	2000-2001	2001-2002	2002-2003
MUN	278	220	1,035	1,266	1,600	1,237
UPEI	73	68	98	140	249	299
Acad	191	196	306	218	303	358
CBU	66	109	195	369	285	72
Dal	515	715	1,329	1,251	1,924	2,150
UKC	2	2	2	2	11	22
MSVU	96	96	151	84	149	244
NSAC	28	12	8	4	4	213
NSCAD	0	0	0	5	0	0
SFXU	79	126	482	712	884	923
SMU	112	210	305	393	543	465
USA	16	0	19	46	34	28
MTA	100	148	140	118	75	142
UdeM	177	237	262	225	810	213
UNB	316	299	306	790	622	952
STU	14	14	11	23	73	118
Total	2,063	2,452	4,648	5,645	7,565	7,435

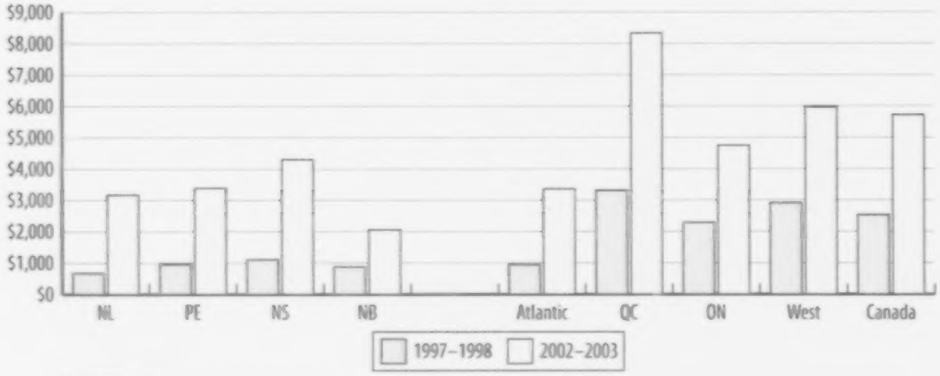
* Constant dollars.
Source: CAUBO, Report 3.1; author's calculations.

However, as with NSERC funding in relation to faculty in the natural sciences and engineering disciplines, Atlantic Canada's proportion of SSHRC funding lags behind the rest of Canada when considered per full-time faculty in the social sciences and humanities, as shown in the next section.

Funding and Distribution Trends by Full-time Faculty—Canada and Atlantic Canada

On a full-time faculty member basis, SSHRC funding increased considerably between 1997–1998 and 2002–2003 (Figure 3.6). This was particularly true for Newfoundland & Labrador (+370%) although all Atlantic provinces showed growth above (or close to par in one case) other regions. Despite this growth, however, Atlantic Canadian universities still received the lowest funding per full-time faculty in 2002–2003 (just under $3,400). Ontario had the next lowest income level ($4,749) which is somewhat surprising given that this province is the lead in the majority of measures highlighted throughout this report.

Figure 3.6
SSHRC Revenues Received per Full-time Faculty in the Social Sciences and Humanities Disciplines by Region and Atlantic Province, 1997–1998 and 2002–2003 ($000)

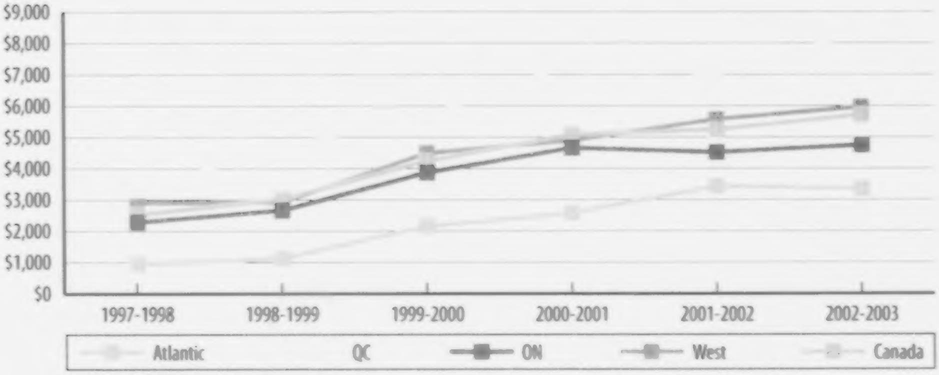


* Constant dollars.
Source: CAUBO; Statistics Canada; author's calculations.

The following graphs (Figures 3.7 & 3.8) show this same measure over time. As expected given data in the previous section, SSHRC funding in all regions increased considerably between 1997–1998 and 2002–2003. Although decreases were experienced by each region at some point over the period, surprisingly, the Atlantic (-4% between 2001–2002 and 2002–2003) and Western (<1% between 1997–1998 and 1998–1999) provinces showed the smallest decreases. Québec (-8%) and Ontario (-7%) universities had similar decreases; however, throughout the period, Québec universities enjoyed a higher level of funding per full-time faculty member than in Ontario, or in any other region.

Figure 3.8 focuses more closely on the Atlantic provinces. Here, there is a noticeable difference in SSHRC funding received in Newfoundland and Labrador and Nova Scotia and that received in Prince Edward Island and New Brunswick. This is not surprising given the information presented in Figure 3.6. What is interesting is the sharp increase experienced by Newfoundland and Labrador between 1998–1999 and 1999–2000. During this period, SSHRC awards per full-time faculty member increased by more than $2,000 (377%)—a much larger increase than the other Atlantic provinces at any point during this time (although Nova Scotia experienced a sizeable increase, 87%, between the same years).

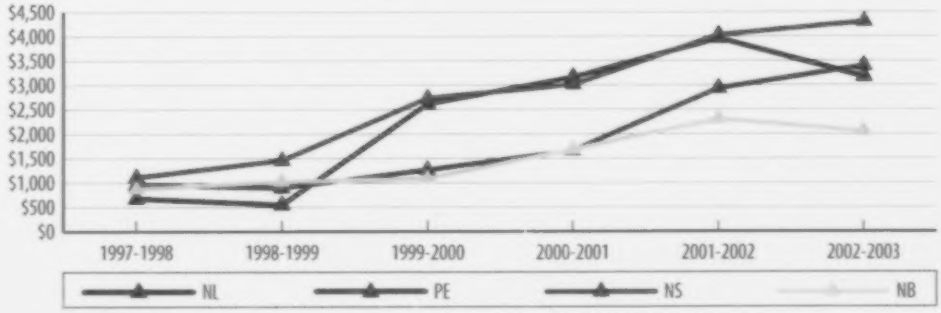
Figure 3.7
SSHRC Revenues Received per Full-time Faculty in the Social Sciences and Humanities Disciplines by Region, 1997–1998 to 2002–2003 ($000)



* Constant dollars.
Source: CAUBO; Statistics Canada; author's calculations.

This time period, and the further increasing or at least maintaining, of this level of funding, is what set these two provinces apart from their Atlantic counterparts until 2001–2002. However, as shown in the graph, Newfoundland and Labrador lost ground in the last year of reporting, dropping from nearly $4,000 per full-time faculty in 2001–2002 to just under $3,200 in 2002–2003 (a decrease of 20%). This decrease, and the continued increase (particularly between 2000–2001 and 2002–2003) experienced in Prince Edward Island, resulted in a shift in the initial provincial pairings, as SSHRC funding in Prince Edward Island met then passed SSHRC funding in Newfoundland and Labrador. As a result, Prince Edward Island ($3,397) and Newfoundland and Labrador ($3,173) had very close per faculty funding levels by 2002–2003 while Nova Scotia had higher ($4,302), and New Brunswick lower ($2,056), funding amounts.

Figure 3.8
SSHRC Revenues Received per Full-time Faculty in the Social Sciences and Humanities Disciplines by Atlantic Province, 1997–1998 to 2002–2003 ($000)



* Constant dollars.
Source: CAUBO; Statistics Canada; author's calculations.

Funding and Distribution Trends by University Type

Growth in SSHRC funding for medical-doctoral and primarily undergraduate universities outpaced comprehensive universities between 1997–1998 and 2002–2003. Primarily undergraduate universities had the highest reported growth at 194% moving from an average of $98,000 in 1997–1998 to $288,000 by 2002–2003 (Table 3.6). Medical-doctoral universities received an average of just under $5 million in SSHRC income, up 143% from 1997–1998 (just under $2 million). Comprehensive universities' SSHRC income, although lower in growth than the other university types, grew a sizeable 96%, increasing from an average of just under $1 million in 1997–1998 to almost $2 million in 2002–2003.

Table 3.6
SSHRC Revenues Received by Canadian Universities, by Type, 1997–1998 to 2002–2003 ($000)

	1997-1998	1998-1999	1999-2000	2000-2001	2001-2002	2002-2003
Medical-Doctoral	28,571	35,222	48,737	62,136	59,770	69,527
Average	*1,905*	*2,348*	*3,249*	*4,142*	*3,985*	*4,635*
Comprehensive	10,347	10,873	15,065	16,848	21,234	20,280
Average	*941*	*988*	*1,370*	*1,532*	*1,930*	*1,844*
Primarily Undergraduate	2,542	2,864	4,748	5,925	7,282	7,475
Average	*98*	*110*	*183*	*228*	*280*	*288*
Total	41,460	48,959	68,549	84,909	88,285	97,282

* Constant dollars;
Source: CAUBO, Report 3.1; author's calculations.

It should also be noted that over the six fiscal years, three or fewer primarily undergraduate universities did not report receipt of SSHRC funding at all; up to seven universities had not reported sponsored research income from NSERC in a given year[52] (as shown in a later section, CIHR sponsored research income was even more centralized with fewer universities having reported funding).

As was the case with NSERC funding, medical-doctoral universities accounted for more than two-thirds of the total ($69 million or 71%), although this proportion was slightly lower than in NSERC income. Primarily undergraduate universities made up the difference accounting for 8% of SSHRC funding, three points higher than their NSERC proportion.

The relatively small portion of SSHRC funds provided across the country (10% of all granting councils) and the focus on sciences, engineering and health in the newest federal initiatives (as shown in Chapter 4) suggests there is a perceptual issue with respect to the value of this group of disciplines as a potential tool in meeting the broader challenges of increasing innovation. SSHRC's transformation process and resulting transformation documents have begun to address this issue by articulating how social science and humanities research fits within the context of innovation and commercialization. As noted at the outset of section 3.3, documents pertaining to the SSHRC transformation can be found on the Council's website.

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[52] For NSERC and SSHRC funding, all medical-doctoral and comprehensive universities reported some sponsored research income; for CIHR, this was not the case (as shown in the next section).

3.4 The Medical Research Council of Canada (MRC) & Canadian Institutes of Health Research (CIHR)[53]

In 1960, in response to pressure to increase medical research funding and calls to establish a medical research council separate from, but with similar terms to, the National Research Council's Division of Medical Research, the federal government created the *Medical Research Council of Canada (MRC)*. Nearly ten years later, in 1969, this Council was officially established as an autonomous crown corporation, reporting to Parliament following declaration of the Medical Research Council Act.

For the next three decades (1969–1999), the MRC continued to support medical research through programs initially administered through the National Research Council then assumed by the MRC in its earliest years, as well as through programs developed following the Council's formal establishment. In the latter stages of the MRC, particularly following the development of its 1993 strategic plan, this type of funding was expanded to include a broader range of health research, including basic biomedical, clinical, health services and health systems, psychosocial and population health. As such, the MRC set a solid foundation for the development of a modern framework that would bring together all fields of health research in Canada into a new agency: the *Canadian Institutes of Health Research (CIHR)*. Following a one-year transitional phase whereby five groups aided in its development (NSERC, SSHRC, MRC, National Research Council (NRC), and Health Canada (HC)), the CIHR was officially established in 2000—replacing and expanding upon the role of the previous Medical Research Council.

As outlined with the CIHR Act and noted in the Institute's *Report on Plans and Priorities, 2005-2006*, "the mandate of the CIHR is to excel, according to internationally accepted standards of scientific excellence, in the creation of new knowledge and its translation into improved health for Canadians, more effective health services and products and a strengthened Canadian health care system."

In 2004, the CIHR launched the next stage in its development with the release of, *Investing in Canada's Future: CIHR's Blueprint for Health Research and Innovation, 2003-2004—2007-2008*, a strategic plan highlighting the following five key directions for the CIHR:

- strengthen Canada's health research communities;
- address emerging health challenges and develop national research platforms and initiatives;
- develop a balanced research agenda that includes research on disease mechanisms, treatment, prevention and cure, and health promotion;
- harness research to improve health of vulnerable populations; and
- support health innovations that contribute to a more productive health system and prosperous economy.

In pursuing these directions, the CIHR makes use of an expansive funding program supporting both investigator-driven (operating grants, salary awards, training awards, equipment grants, etc.) and strategic (using its 13 Institutes, each with its own strategic plan)[54] research initiatives. For the 2005–2006 fiscal year, the CIHR has approximately $777 million[55] at its disposal for assisting Canada's health research community.

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[53] www.cihr-irsc.gc.ca and the MRC's *Report of the President, 1998-1999.*

[54] Information on each of these network-based, virtual institutes is available at: www.cihr-irsc.gc.ca/e/9466.html.

[55] Budget 2005 proposes to increase the CIHR budget by $32 million bringing this total to $809 million.

The creation of this new granting council, involving as it did some realignment of funding initiatives in NSERC as well as NRC and Health Canada, represented a significant re-investment at the national level in health and broader health-related research. The result, as noted in Figure 3.2, appears to be a redistribution of granting council income received by universities, moving from NSERC at 56% and MRC at 36% in 1997–1998 to NSERC at 45% and the new integrated CIHR at an equal 45% in 2002–2003.

Funding and Distribution Trends—Canada and Atlantic Canada[56]

Table 3.7 shows that the Atlantic provinces received, on average, 3% of total MRC/CIHR funding between 1997–1998 and 2002–2003. With the exception of Saskatchewan (which had lower MRC/CIHR funding than Nova Scotia), funding in each Atlantic province was the lowest in Canada for all six fiscal years, ranging from $9,000 in New Brunswick in 1997–1998 to a high of nearly $12 million in Nova Scotia in 2001–2002. Notably, Nova Scotia increased the Atlantic region's percentage of total awards as it accounted for more than twice the combined funding of the remaining three provinces until the last year, where it still accounted for nearly two-thirds of Atlantic Canada's total. It is important to note that when looking at percentages of the national total, Atlantic Canada is home to just two medical schools[57] and that students from these provinces wishing to study medicine in French (and other health-related fields not offered in French in the region) go to Québec universities under specific interprovincial agreement. In other words, medical school needs (and presumably also related health R&D needs) are not all directly provided within the region itself.

Table 3.7
MRC/CIHR Revenues Received by Canadian Universities, by Province, 1997–1998 to 2002–2003 ($000)

	1997-1998	1998-1999	1999-2000	2000-2001	2001-2002	2002-2003
NL	1,011	1,481	1,555	2,494	3,049	4,210
PE	48	48	58	131	98	536
NS	4,490	5,192	6,051	6,769	11,641	9,969
NB	9	109	10	86	533	695
QC	55,513	70,618	94,269	105,485	134,938	158,684
ON	72,003	79,160	94,268	105,719	135,215	175,921
MB	7,955	8,968	8,630	9,702	13,561	15,590
SK	2,114	2,473	2,616	3,513	5,405	7,770
AB	24,405	26,015	29,646	37,957	49,897	56,912
BC	16,356	18,884	21,232	23,849	35,977	49,302
Maritime Total	4,546	5,349	6,120	6,986	12,272	11,201
Atlantic Total	5,558	6,829	7,675	9,480	15,320	15,411
Canadian Total	183,903	212,947	258,338	295,704	390,313	479,589
Maritime Percentage	2%	3%	2%	2%	3%	2%
Atlantic Percentage	3%	3%	3%	3%	4%	3%

* Constant dollars.
Source: CAUBO, Report 2.1A; author's calculations.

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[56] Prior to publication, MPHEC learned that data for the 2001-2002 fiscal year were mis-classified by the University of Prince Edward Island (UPEI) when reporting to CAUBO. The CIHR total for this province was actually $413,884 ($385,160 in constant dollars) and as such, data should be interpreted with caution.

[57] As indicated earlier, Memorial University of Newfoundland (MUN) is considered a comprehensive university by Maclean's magazine but it does have a medical school.

However, despite the apparent outsourcing in health and health-related research, Table 3.8 shows that by 2001–2002, many more Atlantic universities received funding for sponsored research in the health disciplines than had been the case in previous years. Given the additional funds provided by the federal government to support research, these disbursements suggest the CIHR has in fact expanded beyond the reach of the MRC in as much as the increase in health research funding has allowed more Atlantic universities to access granting council awards for health and health-related research. In 2002–2003 (the latest year available), 10 of the 17 public universities in Atlantic Canada received CIHR funding, up from just five universities in 1997–1998 (although the Atlantic percentage of national funding did not increase as of 2002–2003, having returned to 3% after increasing one point to 4% in 2001–2002).

Table 3.8
MRC/CIHR Revenues Received by Atlantic Canadian Universities, by University, 1997–1998 to 2002–2003 ($000)

	1997-1998	1998-1999	1999-2000	2000-2001	2001-2002	2002-2003
MUN	1,011	1,481	1,555	2,494	3,049	4,210
UPEI	48	48	58	131	98	536
Acad	0	0	0	0	65	8
CBU	0	0	0	0	93	87
Dal	4,481	5,174	6,051	6,769	11,326	9,740
MSVU	9	3	0	0	56	134
NSAC	0	16	0	0	0	0
SFXU	0	0	0	0	101	0
UdeM	0	0	0	0	104	42
MTA	0	0	0	0	47	95
UNB	9	109	10	86	357	488
STU	0	0	0	0	25	71
Total	5,558	6,829	7,675	9,480	15,320	15,411

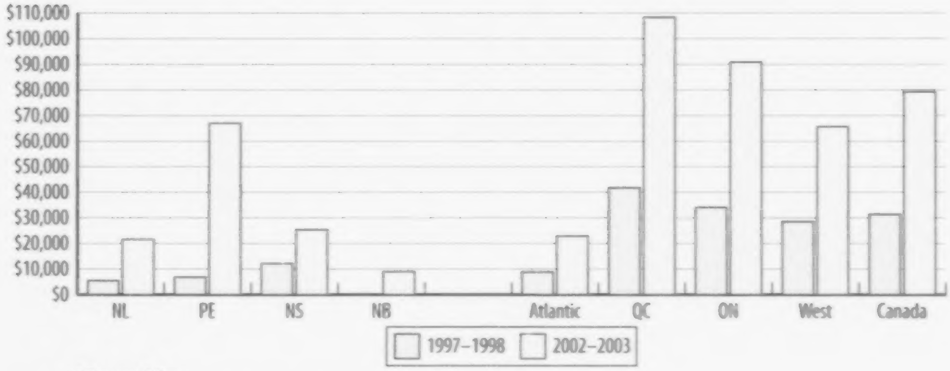
* Constant dollars.

Source: CAUBO, Report 3.1; author's calculations.

Funding and Distribution Trends by Full-time Faculty—Canada and Atlantic Canada

Between 1997–1998 and 2002–2003, funding for sponsored research in the health disciplines had more than doubled (152%) at the national level per FTF (from approximately $31,000 to just under $80,000) (Figure 3.9). In the Atlantic region, this same rate of growth was also experienced, with funding per full-time faculty increasing 158% from $8,850 in 1997–1998 to nearly $23,000 in 2002–2003. Similar growth rates were experienced across the remaining regions with Western Canada having the lowest reported growth, although still a sizeable 130%. Due to the fact that all regions experienced sizeable growth in CIHR income, Atlantic Canada's proportion did not increase relative to other regions and, as a result, funding per faculty in the health disciplines remained considerably lower than anywhere else in the country. This factor may be one of the reasons why several provinces have structured their own R&D strategies specific to the broader health area, as shown in Chapter 5.

Figure 3.9
MRC/CIHR Revenues Received per Full-time Faculty in Health Disciplines by Region and Atlantic Province, 1997–1998 and 2002–2003 ($000)

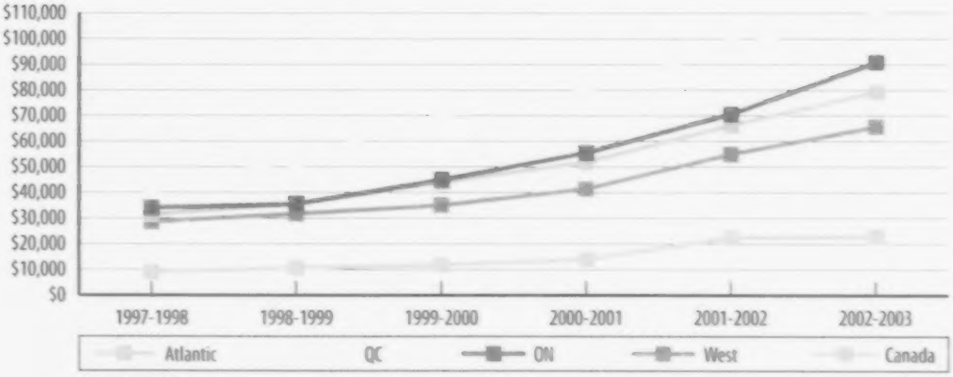


* Constant dollars.
Source: CAUBO; Statistics Canada; author's calculations.

When looking at individual Atlantic provinces, Prince Edward Island stands out. In 2002–2003, its CIHR funding per full-time-faculty was just above that in the West (PE = $67,055; West = $65,640). Two of the remaining Atlantic provinces hovered around the $20-$25,000 mark with New Brunswick having the lowest per faculty funding ($8,915). When examining these numbers, it is important to note that Prince Edward Island faculty include those employed within the Atlantic Veterinary College (AVC) of the University of Prince Edward Island. These faculty would be classified within the natural sciences and engineering, rather than health disciplines. According to staff at UPEI, the substantial increase in CIHR income between 1999–2000 and 2002–2003, was largely the result of increased funding to this body of researchers.

Before turning to an examination of each Atlantic province, Figure 3.10 shows MRC/CIHR income by region over time.

Figure 3.10
MRC/CIHR Revenues Received per Full-time Faculty in Health Disciplines by Region, 1997–1998 to 2002–2003 ($000)

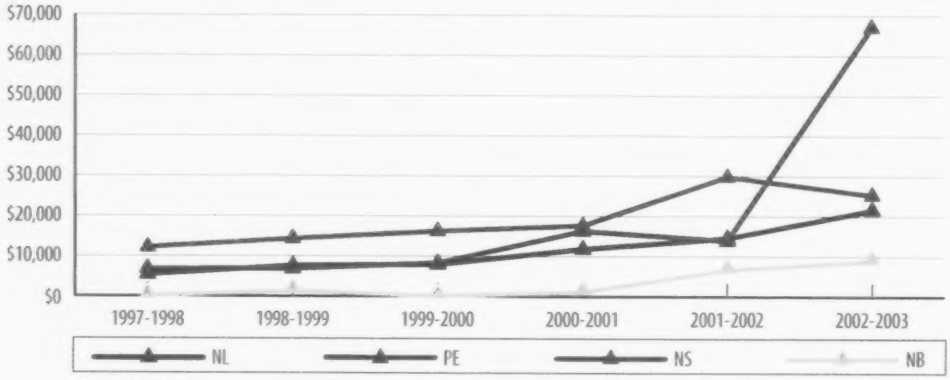


* Constant dollars.
Source: CAUBO; Statistics Canada; author's calculations.

Over the six fiscal years, growth in all regions was substantial. Québec had the highest health research income throughout the period, followed by Ontario, Canada as a whole, the West then Atlantic Canada. What is interesting to note in this graph is that for Atlantic Canada funding levels seem to have stalled between 2001–2002 and 2002–2003 whereas all other regions continued to increase. The following graph (Figure 3.11) shows that this was not the case for each Atlantic province.

In Atlantic Canada, New Brunswick experienced the highest growth in funding between 1997–1998 and 2001–2002, rising from $125 to $6,665. While funding again increased (to $8,915) in the following fiscal year, Prince Edward Island overshadows this increase as its funding per full-time faculty reached more than $67,000.[58] Newfoundland and Labrador also increased steadily over the same period with sharper increases experienced during the latter three years. Finally, Nova Scotia, the highest MRC/CIHR-funded province prior to 2002–2003, had increased to nearly $30,000 in 2001–2002 then decreased to $25,302 in 2002–2003.

Figure 3.11
MRC/CIHR Revenues Received per Full-time Faculty in Health Disciplines by Atlantic Province, 1997–1998 to 2002–2003 ($000)



* Constant dollars.
Source: CAUBO; Statistics Canada; author's calculations.

Funding and Distribution Trends by University Type

Given that MRC and CIHR funding is awarded to research in health and health-related research, understandably, medical-doctoral universities accounted for nearly all MRC/CIHR funding (Table 3.9). Noticeably, this funding proportion slightly decreased (-2%) after the CIHR was put in place—comprehensive universities received the difference. Throughout the six-year reporting period, primarily undergraduate universities received less than 1% of the national total even though their CIHR income had increased 346% between 1997–1998 and 2002–2003 (from $376,000 to almost $2 million). The reason for the relatively little proportion lies largely in the fact that comprehensive universities also increased more than 300%

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[58] As noted earlier, it has come to the attention of the MPHEC that data reported for UPEI were mis-classified for the 2001-2002 fiscal year. While the university experienced a tremendous amount of growth in CIHR income between 1997-1998 and 2002-2003, the revised 2001-2002 figure (approximately $55,000 per full-time faculty member in the health disciplines; in constant dollars) shows that the surge in funding happened in two stages (between 2000-2001 and 2001-2002 and then again between 2001-2002 and 2002-2003) with the largest increase actually occurring between 2000-2001 and 2001-2002.

In addition, AVC faculty are not included in these calculations as they are considered NSE faculty; however, the increase in CIHR income was largely the result of increased funding for these researchers.

while medical-doctoral universities' funding increased 155%. Given the high funding amounts awarded to these university types, funding received by primarily undergraduate universities remained a small fraction of the national total.

Table 3.9
MRC/CIHR Revenues Received by Canadian Universities by Type, 1997–1998 to 2002–2003 ($000)

	1997-1998	1998-1999	1999-2000	2000-2001	2001-2002	2002-2003
Medical-Doctoral	178,820	206,095	250,877	285,320	372,015	455,840
Average	*11,921*	*13,740*	*16,725*	*19,021*	*24,801*	*30,389*
Comprehensive	3,786	4,807	5,531	7,679	13,126	17,487
Average	*344*	*437*	*503*	*698*	*1,193*	*1,590*
Primarily Undergraduate	376	1,300	481	523	1,678	1,676
Average	*14*	*50*	*18*	*20*	*65*	*64*
Total	182,981	212,202	256,889	293,522	386,819	475,004

Source: CAUBO, Report 3.1; author's calculations.

Table 3.9 also shows that in 2002–2003 medical-doctoral universities received an average of more than $30 million from the CIHR. As was the case with NSERC and SSHRC income, all universities in this category received funding in each year. For comprehensive universities, funding was also well disbursed with all universities receiving funding in 2002–2003 and only 1–2 excluded in any year prior. On average, comprehensive universities received nearly $2 million by the final year of reporting. Combined, primarily undergraduate universities reached this amount by 2002–2003, although on average they had received $64,000 from the CIHR. This was a considerable increase from the 1997–1998 funding average ($14,000).

Unlike funding received by other university types (and other granting councils), MRC/CIHR funding was not well disbursed among primarily undergraduate universities. In the final year of reporting, 12/26 (46%) primarily undergraduate universities had not reported CIHR income; this was the most disbursed (and the same as 2001–2002) it had been, as earlier figures show that as many as 19/26 (73%) primarily undergraduate universities had not received MRC funding (1997–1998 and 1998–1999). With such a significant centralization of CIHR, and to a greater extent MRC, funding, it is interesting to look at average funding levels when including only those universities with reported MRC/CIHR income. Including only these universities, average MRC/CIHR funding to primarily undergraduate universities was considerably higher, particularly in the earliest years, ranging from $54,000 in 1997–1998 to $120,000 in 2002–2003.

3.5 The Granting Councils in Atlantic Canada

Overall, Atlantic Canada received much higher levels of granting council funding than was the case just a few years ago. Between 1997–1998 and 2002–2003, the region's granting council income more than doubled (115%). At the national level, growth was also significant (107%), reflecting the recent surge in investment for this source of research income. When considered as a percentage of the national total, the region fares well, having maintained its overall (6%) and CIHR (3%) proportions, while increasing proportionately in NSERC (+1% to 8%) and SSHRC (+2% to 7%) funding.

When each granting council is examined individually, data show that there is clear variation in the amount of income received. Health research funding is considerably lower in Atlantic Canada than funding for other disciplines. This can partly be explained by the small number of health (medical-doctoral) schools in the area; however the type of university does not completely account for differences as funding per full-time faculty member in the health disciplines is also low—a significant finding given the broader mandate of the CIHR. Clearly, there is a need to strengthen the base of regional research candidates who are involved in health and health-related research in Atlantic Canada.

Given the data outlined in this chapter, criteria for awarding funding within each granting council could be examined to determine if universities might benefit from revised criteria that consider variation in university and/or regional strengths, structures and needs. For example, given the region's heavy focus on undergraduate education, a program that supports early research exposure would be particularly welcome. Other programs, like SSHRC's Aid to Small Universities and NSERC's Research Capacity Development in Small Universities pilot project, could also be implemented or expanded upon to allow targeted funding to be accessible by smaller universities who do not have the critical mass to compete on equal footing with larger institutions.

Chapter 4—*The Federal Research Funding Environment:*

findings

New Federal Initiatives

Implementation of the federal Innovation Strategy has resulted in an expansion of the federal funding environment for research and research infrastructure. This expansion includes increased investment into long-standing R&D programs (e.g., granting councils) as well as implementation and/or continuation of new R&D initiatives (e.g., the Canada Research Chairs program, the Canada Foundation for Innovation, the Indirect Costs program) to help researchers obtain the capital they need to get a project underway, assist institutions in supporting increased R&D and/or move a research project toward commercial application.

Several of the newest federal R&D initiatives require matching funding. This is a challenge for Atlantic Canada's universities for two main reasons. First the region's private sector, consisting primarily of small to medium size industries, has limited resources to devote to R&D resulting in a limited pool of potential funding partners. Second, while elsewhere in the country provincial governments have stepped in to provide matching funds for these federal research funding initiatives, in Atlantic Canada, this type of support is relatively new and considerably limited.

Demonstration of previous granting council success, the second criterion common to most funding programs, also places Atlantic Canada, with its primarily undergraduate universities, at a disadvantage as it does not have the R&D foundation evident in larger, more research-intensive universities.

Atlantic Canada, notwithstanding the challenges resulting from program design described above, has made use of several funding mechanisms launched within the federal Innovation Strategy. For example:

- In November 2004, Atlantic Canada was home to 94 (7%) of Canada's 1,348 Canada Research Chairs.
- As of April 2004, Atlantic universities received more than $80 million (4% of the national total) from the CFI, with varying levels of success within its assortment of programs. Notably, the University Research Development Fund, the program in which the region's universities were best suited to receive funding, was not available after 2001.

While increased R&D expenditure is a measure of success within the federal Innovation Strategy, this activity comes at a price as universities, and other research institutions, must support the indirect costs of this research. In response to concerns over these costs, the federal government committed funding designed to offset this challenge through the Indirect Costs program. Of the most recent R&D initiatives, this program appears to best take smaller universities into consideration as it provides a higher proportion of eligible costs to universities with the lowest levels of granting council funding. As of 2004-2005, Atlantic universities received more than $49 million, or 8%, of all Indirect Costs funding.

4.1 Overview of the Federal Research Funding Environment

As indicated earlier, in its 2002 Innovation Strategy, the federal government announced its intention to reposition Canada as one of the top-ranked innovative countries in the world. In order to achieve this goal, the federal government increased its funding to the three granting councils (as shown in the previous chapter), restructured and/or reinvested in innovation-related programs and created new initiatives to facilitate more rapid growth of national R&D and commercialization. The addition of these new initiatives to other long-standing programs was illustrated in Figure 3.1 of the previous chapter.[59]

Working from this diagram, it is clear that the three granting councils play a central role in the federal government's research funding environment. While they operate independently, they are interrelated in that they provide parallel functions for their respective disciplines. Each plays a role in the workings of the Networks of Centres of Excellence, Canada Graduate Scholarships, Canada Research Chairs and Indirect Costs programs. The Canada Foundation for Innovation and the Canadian Health Services Research Foundation also operate within this federal funding environment; however, they operate independently from the three granting councils (although some of their programs are administered based on previous granting council success).

- *Networks of Centres of Excellence (NCEs)*—is a program that builds networks among researchers from various fields and sectors. The research network involves a group of partners from university, industry and other sectors who work with researchers to develop a strategy to set joint research goals. The research is then supported through the NCE programme, by industry and by the universities, all acting in partnership. Through these networks, innovations in the market and greater productivity is often the result. In Spring 2005, Canada had 21 NCEs involving 79 universities across Canada. Of these, 18 included research partners in Atlantic Canadian universities[60] with one (Aquanet—Network in Aquaculture, 1999-2006) located in Newfoundland and Labrador.[61]

- *Canada Graduate Scholarships (CGS)*—were announced in the federal government's 2003 budget as an initiative to help renew the faculty at Canadian universities. The government committed $80 million dollars over the first two years, with costs expected to reach $105 million once the program is fully implemented, for the creation of 4,000 graduate-level scholarships (2,000 master's; 2,000 doctoral). These scholarships were to be administered by the three granting councils and were divided according to distributions within the graduate student community (60% SSHRC; 30% NSERC; 10% CIHR). In fiscal year 2003-2004, 1,153 CGS payments had been made across Canada, of which 72 were to students in the Atlantic provinces (Maritime = 57). While scholarships through the CIHR were not awarded in Atlantic Canada, NSERC and SSHRC-based scholarships were in keeping with the region's graduate enrolment proportions.[62]

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[59] Note that in Chapter 3 several other mechanisms were pointed out that also play a part in advancing the federal funding environment, this list was not, nor was it intended, to be comprehensive (others could also be added, Genome Canada, for example). A full examination of all research funding programs is beyond the scope of this report; however, the SSHRC diagram provides a good starting point for understanding the federal research funding environment and allows for the Canada Research Chairs Program, the Canada Foundation for Innovation and the Indirect Costs Program, to be situated within a larger context.

[60] Three networks were too early in their development to allow for a breakdown by region; however, each included Atlantic Canadian universities in diagrams illustrating provincial reach of the network (www.nce.gc.ca/nets_e.htm).

[61] For additional information on each network refer to the program website: www.nce.gc.ca

[62] According to each granting council's website, and for the CIHR, data provided via request, CGS award payments within each granting council included: NSERC = 271 Canada, 18 Atlantic (7%), 15 Maritime (6%); SSHRC = 811 Canada, 54 Atlantic (7%), 42 Maritime (5%); CIHR = 71 Canada, 0 in Atlantic Canada.

- The *Canada Research Chairs Program (CRCP)*—was designed to provide funding to Canada's research institutions to help increase their research abilities and global competitiveness. Canada Research Chairs are awarded based on an institution's previous granting council success with a set number of positions (180 special allocations) distributed among the smallest universities. In total, the program will allocate 2000 Canada Research Chairs using a $900 million investment, by the end of 2005. Through these positions, universities are expected to be better positioned to attract sponsored research income, to promote their strategic research priorities and to enhance their overall research capacity, all with the express goal of contributing to Canada's knowledge-based economy.

- The *Indirect Costs Program*—was created with the direct objective to help Canada's degree-granting institutions cope with the indirect costs of increasing their research capacity. Through a one-time $200 million investment, the government committed to help institutions deal with these costs. In 2003-2004, the federal government furthered this commitment by making the Indirect Costs program an annual investment. Like the Canada Research Chairs program, the Indirect Costs program provides funding based on each institution's previous granting council success with a staggered funding formula so that smaller projects receive a larger proportion of their eligible expenses.

- The *Canadian Health Services Research Foundation (CHSRF)*—was created in 1997 with a one-time investment of approximately $67 million. In 1999, an additional $60 million was invested of which a ten-year, $25 million Nursing Research Fund was established. The CHSRF "funds management and policy research in health services and nursing; supports the synthesis and dissemination of research results; and supports the use of research results by managers and policy makers in the health system."[63]

- The *Canada Foundation for Innovation (CFI)*—was set up as a key initiative for renewing the research infrastructure of Canadian institutions. Established as an independent entity, the CFI began, in 1997, with an initial endowment of $800 million dollars which was later expanded to just under $3 billion. As a matching fund scheme, most programs under the CFI support up to 40% of the eligible infrastructure costs of major research projects (some will support up to 100% of the costs) with the responsibility for funding of the remaining costs resting with the successful applicant.

The most salient initiatives within Atlantic Canada's academic community are addressed in further detail in this chapter: the Canada Research Chairs Program, the Canada Foundation for Innovation and the Indirect Costs Program.

4.2 Canada Research Chairs Program (CRCP)

In 2000-2001, the federal government committed $900 million to a new Canada Research Chairs Program (CRCP). The Canada Research Chairs Program was intended to provide assistance to universities in trying to recruit top and promising researchers to study at their institutions. More specifically the program seeks to:[64]

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[63] www.chsrf.ca/home_e.php

- strengthen research excellence in Canada and increase Canada's research capacity by attracting and retaining the best researchers;
- improve training of highly qualified personnel through research;
- improve universities' capacity to generate and apply new knowledge; and
- promote the best possible use of research resources through strategic institutional planning, and through collaboration among institutions and between sectors.

Canada Research Chair Allocations

Of the total 2,000 Chairs created, 1,880 are considered regular allocations and are distributed as follows: 45% (846) for research in natural sciences and engineering; 35% (658) for research in health sciences and 20% (376) for research in the social sciences and humanities. Universities can nominate a researcher to fill one of these positions provided they received an allocation through the Canada Research Chairs Secretariat. Allocations are determined based on the amount of funding university researchers received, in the three years prior to the year of allocation, from eligible programs[65] of the three granting councils: Natural Sciences and Engineering Research Council (NSERC), Social Sciences and Humanities Research Council (SSHRC) and the Canadian Institutes of Health Research (CIHR).

Some concern has been expressed with this allocation formula in that it does not fall in line with full-time faculty statistics.[66] In Canada, the social sciences and humanities disciplines employ a greater percentage of faculty than do the natural sciences and engineering disciplines. For the Atlantic region, this concern is augmented by the fact that faculty in the health disciplines make up a very small percentage of faculty in two of the three provinces, compounding the potential difficulty in obtaining Canada Research Chairs. The major concern however is that past history (previous granting council success) governs future access to Chairs. This presents particular difficulties for smaller universities who want to build a new research base or who have previously tended to fund their research activities internally from operating grants rather than going to the granting councils.

In part in anticipation of these concerns, the Canada Research Chairs program added a provision for special allocations. In all, 120 of the 2,000 Chairs created are considered to be special allocations which are intended for universities that received one per cent or less of eligible funding paid out by the three granting councils. These Chairs are not allocated by granting agency, thus universities can choose the area in which they would like to use the Chair.[67] This special allocation has been a positive factor for many universities in Atlantic Canada since it adds more flexibility to the nomination process. It also gives more leeway in nominating researchers in the field of a university's choice; although these nominations remain limited by overall allocations.[68]

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[64] www.chairs.gc.ca/web/about/index_e.asp

[65] Excluded granting council programs (and program families) are: *NSERC*—Undergraduate Student Research Awards, Postgraduate Scholarships (all types), Postdoctoral Fellowships, Industrial Research Fellowships and Canada International Fellowships, Canada Graduate Scholarships, Canadian Microelectronics Corporation. *SSHRC*—Doctoral Fellowships, Postdoctoral Fellowships, all Internships and Fellowships paid to universities, all Research Communications Grants including the ones paid to university presses (except Research Conferences and International Congresses in Canada), Canada Graduate Scholarships. *CIHR*—Fellowships including Clinician Scientists Awards—Phase 1, Studentships/Doctoral Research Awards, Summer Student Programs, Exchange Programs, Institute of Genetics Short-Term Research Visits, Canada Graduate Scholarships.

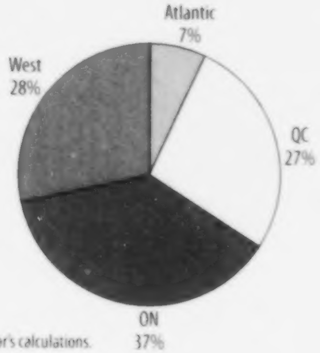
It should be noted that additional programs were added to this list in Fall 2004, the complete list is found at http://www.chairs.gc.ca/web/program/research_grants_e.asp.

[66] For example, the allocation formula is cited as one of the reasons fewer female Canada Research Chairs are appointed. It is argued that by allocating only 20% of Chairs to the social sciences and humanities, a key employment area of female faculty, the Chairs program places women at an immediate disadvantage (see Tamburri, R. (2003, April). "Women professors file complaint about research chairs program." *University News*).

[67] Some universities are eligible for both a regular allocation and a special allocation.

Figure 4.1 shows the distribution of all allocations (regular and special)[69] by region.

Figure 4.1
Distribution of Canada Research Chair Allocations, by Region



Source: CRCP; author's calculations.

Given the high proportion of granting council funding awarded to Ontario and Québec universities (as seen in Chapter 3), it is not surprising to learn that these provinces accounted for more than half of all Canada Research Chair allocations (37% and 27%, respectively). Also as expected given the program's reliance on granting council funding as a determinant of allocations, the Atlantic provinces received the lowest proportions nationally (7%).

Canada Research Chairs by Tier, Region and Atlantic Province

According to the program website, Canada Research Chairs, whether regular or special allocation, are divided into two levels, Tier 1 and Tier 2:

- *Tier 1 Chairs,* tenable for seven years and renewable, are for outstanding researchers acknowledged by their peers as world leaders in their fields. For each Tier 1 Chair, the university receives $200,000 annually for seven years.
- *Tier 2 Chairs,* tenable for five years and renewable once, are for exceptional emerging researchers acknowledged by their peers as having the potential to lead in their field. For each Tier 2 chair, the university receives $100,000 annually for five years.

For regular allocations, the first Chair allocated is a Tier 2, followed by a Tier 1. Special allocations are awarded in the reverse order (Tier 1 then Tier 2) along the following guidelines:

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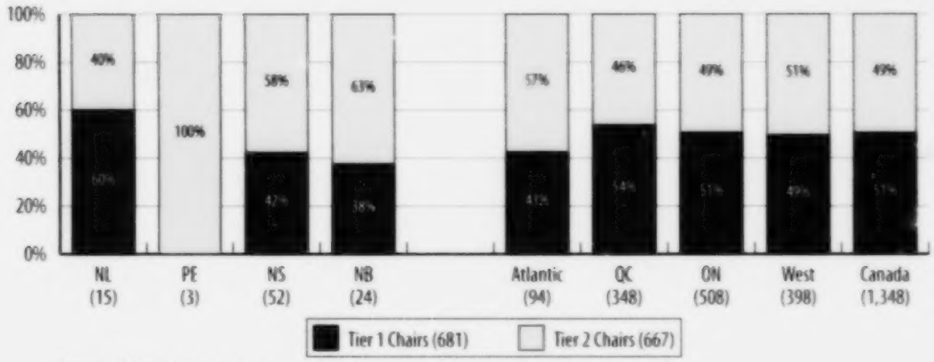
[68] Although there is more flexibility for Chairs when considering Tier level as described in footnote 70.

[69] These allocations include all awarded between 2000-2001 and 2004-2005. Allocations for Year 6 of the Program were announced in Spring 2005 and are available on the CRCP website. In Year 6, some universities gained and others lost previously allocated Chairs signaling that longer-term monitoring of Chair allocations, and filled positions, will be considerably important.

- If a university receives an average of at least $100,000 in research funding from the three granting agencies [councils] over the three-year period, it receives one Tier 1 Chair.
- If a university receives an average of $200,000 or more in funding from the three granting agencies [councils] over the three-year period, it receives three Chairs: one Tier 1 and two Tier 2 Chairs.

No matter the type of allocation, universities have some flexibility in how they use these positions as the Chairs program allows for a limited amount of interchange between tier levels (and across disciplines).[70] For Canada as a whole, the 1,348 Chairs filled as of November 2004 were fairly evenly distributed between tier levels (Tier 1 =51%; Tier 2 =49%) with similar distributions also found in the Western provinces and Ontario (Figure 4.2). In Québec and the Atlantic provinces, slightly higher proportions of Chairs were found in opposite tier levels. In Québec, Tier 1 Chairs accounted for 54% of total Chairs, while in Atlantic Canada Tier 2 Chairs made up the majority of its 94 Research Chairs (57%). Tier 2 Chairs outnumbered Tier 1s in each Maritime province with all three Prince Edward Island Chairs being Tier 2 positions. Newfoundland and Labrador differed from the Maritime provinces in this regard as the majority of its Chairs were Tier 1 positions (60%).

Figure 4.2
Distribution of Canada Research Chairs by Tier, Region and Atlantic Province



Source: CRCP; author's calculations.

Distribution of Canada Research Chairs by Tier and University Type

As expected, medical-doctoral universities accounted for the largest proportion (75% or 931) of the 1,235 Canada Research Chairs awarded to universities within the Maclean's-based categories. Comprehensive universities followed accounting for approximately 18% (223) with primarily undergraduate universities accounting for the final 7% (81). These proportions differ from granting council figures reported earlier as comprehensive and primarily undergraduate universities each accounted for three percentage points more of the total distribution than they had for total granting council funding; this is likely the result of special allocations. Within each Tier level, medical-doctoral and comprehensive universities accounted for the majority; however, primarily undergraduate universities were home to a considerably larger proportion of Tier 2 Chairs (9%) than Tier 1 (4%), given their overall percentage (7%).

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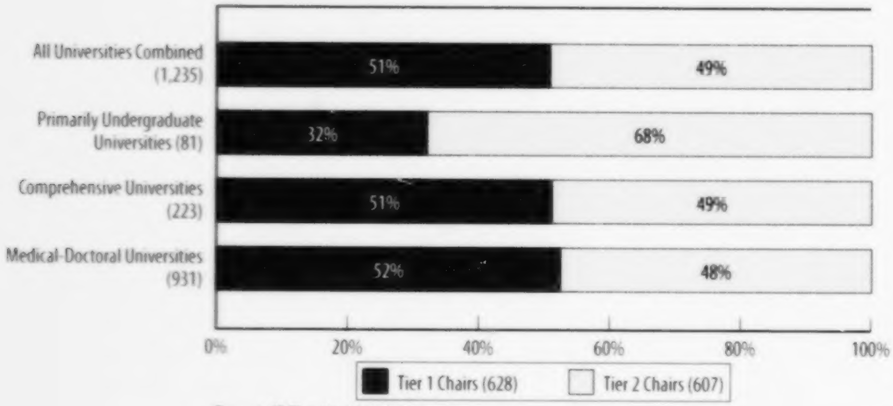
[70] For the 1,348 Chairs discussed in this report, flexibility options were as follows: universities with five to 19 Chair allocations, two Chairs (one Tier 1 and one Tier 2) were considered flexible; universities with twenty to seventy Chairs had seven (three Tier 1 and four Tier 2) flexible allocations while those with more than seventy Chairs had nine (four Tier 1 and five Tier 2) flexible allocations. Universities that qualified for special allocations also had some degree of flexibility, and could substitute one Tier 1 Chair for two Tier 2 Chairs or vice versa. In March 2005, the Chairs program revised this flexibility corridor resulting in increased flexibility for smaller universities—further details on the new flexibility options can be found at http://www.chairs.gc.ca/web/program/allocations_e.asp.

Figure 4.3 demonstrates the distribution of Chairs by Tier within each university type.

Figure 4.3
Distribution of Canada Research Chairs by Tier, University Type



Source: CRCP; author's calculations.

For medical-doctoral, comprehensive and all universities as a group, the distribution of Chairs between tiers was relatively close with just three to four percentage points in the difference. For primarily undergraduate universities, the picture is quite different. For these universities, Tier 2 positions accounted for just over two-thirds of their total Chairs (Tier 1=32%; Tier 2=68%), a significant shift from distributions within larger universities.

Canada Research Chairs by Granting Council, Region and Atlantic Province

Canada Research Chairs are allocated based on previous granting council success within each group of disciplines (Natural Sciences and Engineering, Social Sciences and Humanities, and Health). As such, when universities are awarded Chair allocations, these Chairs are specified by discipline.[71] While universities are permitted to transfer a select number of allocations from one group of disciplines to another, the broad discipline in which the Chair will work is largely pre-determined. Further still, in determining Chair allocations the Canada Research Chairs Secretariat works to fulfill its allocation formula of 45% of Chairs allocated to the Natural Sciences and Engineering, 35% to Health and 20% to Social Sciences and Humanities disciplines. Given the reliance on previous funding success within *each* granting council (rather than granting council funding as a whole), the following paragraphs examine Canada Research Chair distributions in each granting council by region, Atlantic province and university type.

As evident in Figure 4.4, for the 1,348 Chairs filled as of November 2004, the allocation formula was nearly reached. Chairs under NSERC accounted for 45% of the Canadian total with CIHR and SSHRC just slightly under and above the allocation formula (CIHR = 32%; SSHRC = 23%). On a regional basis, proportions were slightly different. In Québec, NSERC Chairs (41% or 144/348) accounted for a slightly lower

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[71] With the exception of special allocations which are not awarded by discipline, thus universities can choose under which council to nominate a researcher.

- If a university receives an average of at least $100,000 in research funding from the three granting agencies [councils] over the three-year period, it receives one Tier 1 Chair.
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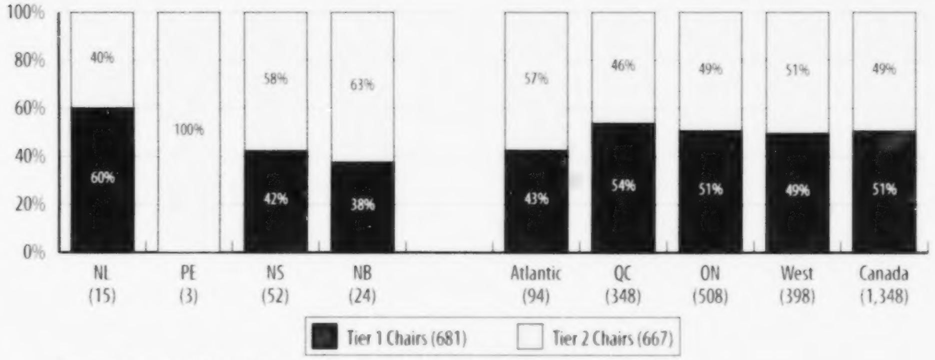

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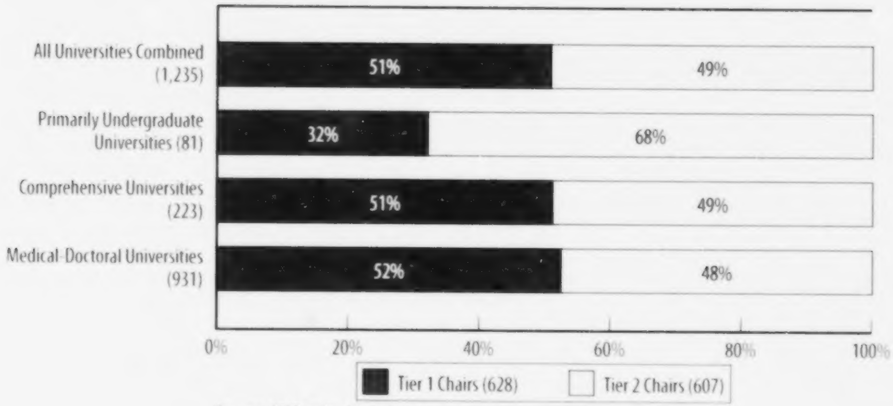

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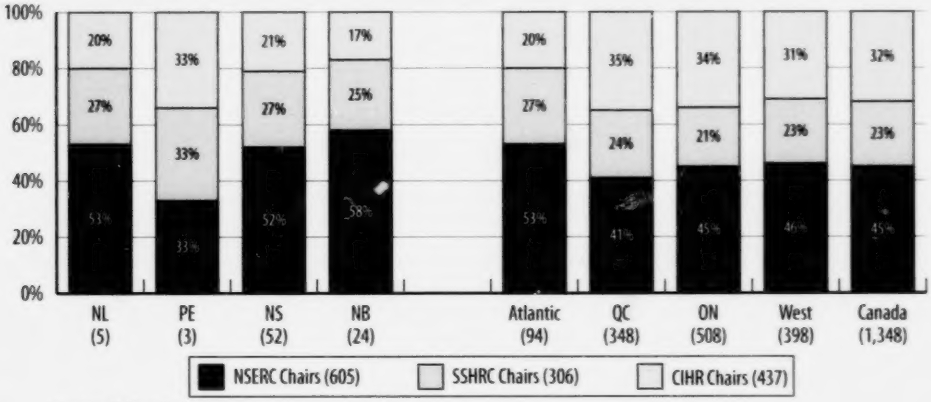
[71] With the exception of special allocations which are not awarded by discipline, thus universities can choose under which council to nominate a researcher.

Figure 4.4
Distribution of Canada Research Chairs by Granting Council, Region and Atlantic Province



Source: CRCP; author's calculations.

Within Atlantic Canada, NSERC Chairs accounted for the largest proportion of Chairs in each province followed by SSHRC then CIHR (with the exception of Prince Edward Island which had one Chair in each granting council). For Newfoundland and Labrador, and Nova Scotia, distributions were similar across granting councils with variations from national distributions coming largely from lower proportions of CIHR Chairs (approximately 20% compared to the Canadian proportion of 35%). In New Brunswick, the under-representation of CIHR Chairs was slightly more pronounced (17%) with the high proportion of NSERC Chairs (58%) accounting for a large part of the difference. These distributions are not surprising given the granting council funding described earlier in the report.

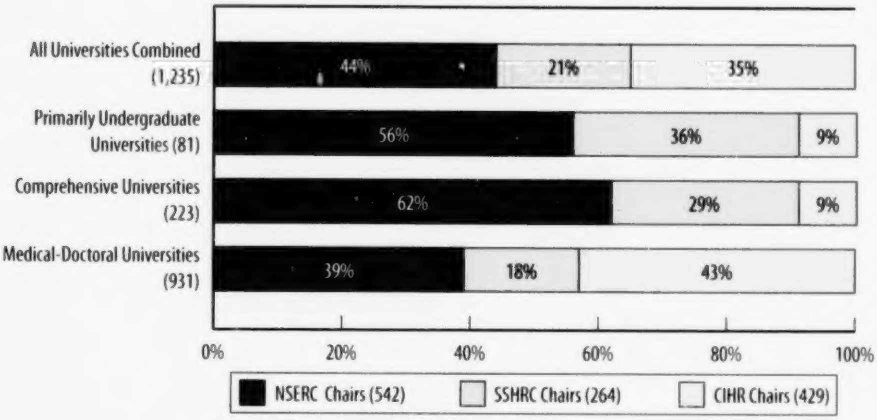
In the end, data on the Canada Research Chairs program show that granting council percentages at the national level do not coincide with distributions of Chairs in Atlantic Canada. This may be troublesome, for although the region is home to just two medical schools, it had approximately the same proportion of full-time faculty in the health disciplines as Canada as a whole and all other regions in Canada. As shown in Chapter 3, however, the Atlantic provinces received only minimal amounts of funding from the CIHR—the determinant of Chairs by discipline. If distributions of Canada Research Chairs are to be more reflective of national allocations, researchers would have to more than double their CIHR funding success.

Distribution of Canada Research Chairs by Granting Council and University Type

It is not surprising to learn that medical-doctoral universities accounted for the highest proportion of Chairs in each discipline, with significantly more under the CIHR (94%) granting council than either NSERC (66%) or SSHRC (64%). Comprehensive universities accounted for one quarter of all Chairs in the natural sciences and engineering as well as social sciences and humanities disciplines (25% for each) and approximately 5% of CIHR Chairs. Chairs found in primarily undergraduate universities were most visible in social sciences and humanities disciplines (11% of the national total) followed by NSERC (8%) and CIHR (2%) disciplines. This is a predictable ordering of distributions across university types, though in noticeably higher proportions, than found in granting council funding.

Figure 4.5 shows the distribution of Canada Research Chairs, by granting council within each group of universities and for Canada as a whole.

Figure 4.5
Distribution of Canada Research Chairs by Granting Council by University Type



Source: CRCP; author's calculations.

In total, the distribution of Chairs by granting council was nearly identical (NSERC=44%; SSHRC=21%; CIHR=35%) to that found in the overall allocation formula. However, for each university type, the distribution varied considerably. In November 2004, medical-doctoral universities were home to proportionately more Canada Research Chairs under the CIHR than any other granting council (43%). NSERC (39%) followed closely behind, while SSHRC Chairs made up less than one-fifth of the medical-doctoral universities' total (18%). In comprehensive and primarily undergraduate universities, CIHR Chairs accounted for the same proportion of Chairs (9% within each) with NSERC and SSHRC accounting for sizeable proportions. In comprehensive universities, NSERC Chairs accounted for more than half of filled positions (62%) while SSHRC Chairs accounted for the remaining 29%. In primarily undergraduate universities the same order applied; however, NSERC Chairs accounted for a lower proportion (56%), and SSHRC Chairs a higher proportion (36%), than found in comprehensive universities.

Origins of Canada Research Chairs

It should be noted that the majority of Canada Research Chairs were filled by researchers from within Canada (71% or 953); however, close to one third (29%) were filled by foreign recruits (207) and expatriates (188). The fact that approximately one third of Canada Research Chairs are from outside Canada is encouraging with respect to the intention of the program (to assist universities in recruiting top and promising researchers) as it signifies that, at least at the national level, the program is adding to the country's research capacity by drawing researchers into our institutions.[72] In Atlantic Canada, international recruits were less represented than at the national level; however, the region's proportion (23%) was approaching the national average.

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[72] For additional details on the origins of Canada Research Chairs refer to the program website: www.chairs.gc.ca.

proportion of total Chairs, and SSHRC more (24% or 83/348), than national allocations. In Atlantic Canada variation from the national average was more pronounced with NSERC accounting for approximately 10 percentage points more Chairs (53% or 50/94) than found nationally. Following from this, SSHRC and CIHR proportions were also quite different from national distributions, with Atlantic Canada having a seven point higher proportion of SSHRC Chairs (27% or 25/94), and a 15 point lower proportion of CIHR Chairs (20% or 19/94), than the national average.

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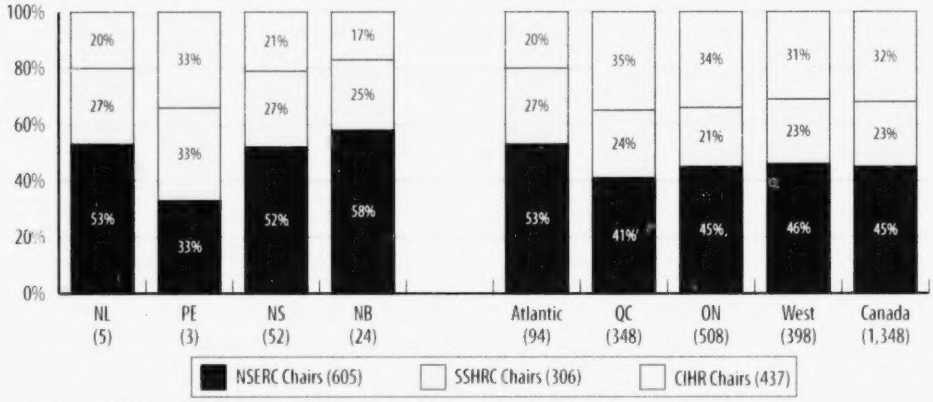

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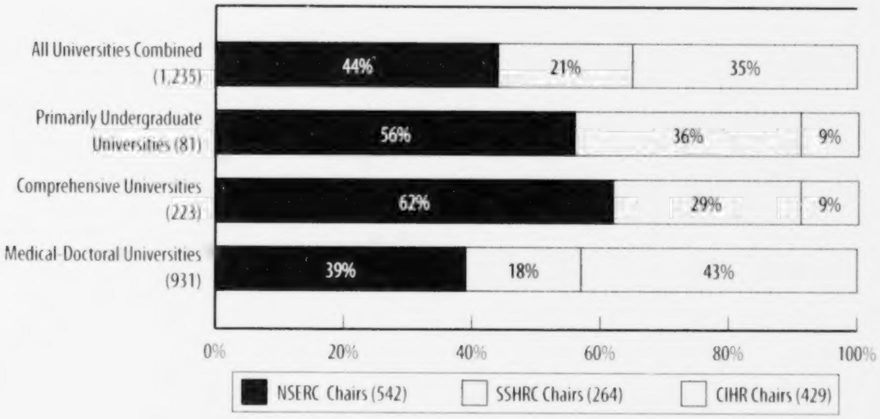

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[72] For additional details on the origins of Canada Research Chairs refer to the program website: www.chairs.gc.ca.

Gender and the Canada Research Chairs Program

Finally in examining the Canada Research Chairs program, it would be remiss not to acknowledge that the program has come under fire for a perceived lack of representation from both female and male researchers. In response to this critique, the Chairs program has published a three-year review of the program and statistics of Canada Research Chairs by gender on its website. In brief, of the 1,348 Chairs filled as of November 2004, 20% (270) were female researchers. This represents the same proportion as the number of females nominated (320/1,613) and approved by the Secretariat (283/1,428) as of this same date, suggesting the program itself does not discriminate against women. However, arguments have been made that the program's design, specifically the allocation formula, places women at an immediate disadvantage.[73]

For further information on gender distributions within the Canada Research Chairs program refer to the Chairs website (www.chairs.gc.ca) for publications in this regard.

Smaller Universities and the Canada Research Chairs Program

Although Canada Research Chairs have the potential to increase a university's research capacity, the program's design is challenging for smaller universities. While it is essential to build clusters of research excellence (Tier 1 positions) or emerging excellence (Tier 2 positions) across the country, basing allocations on previous granting council success tends to strengthen those who are already strong research performers. It does less to help smaller universities that have little or no track records with respect to granting council funding and that have relatively small numbers of faculty spread across a number of disciplines. Special allocations and flexibility within the application process help to offset this challenge; however, smaller universities, of which Atlantic Canada is home to a considerable number, still find it difficult to generate meaningful clusters of expertise within the current allocation system. Inter-university collaboration helps, but quite often universities (small and large) are in competition to recruit and retain top researchers thus collaboration is not pursued.

4.3 Canada Foundation for Innovation (CFI)

Overview

The 1997 federal budget announcement of the establishment of a Canada Foundation for Innovation (CFI) was hailed, in the original report, as a key initiative in renewing the research infrastructure of Canadian universities, colleges, research hospitals, and other not-for-profit institutions. Since its initial investment of $800 million, CFI's investments in research infrastructure have approached $3 billion. Designed to provide the above-mentioned institutions with leading-edge research equipment and facilities, the CFI's mandate is to target areas of science, engineering, health and environment in research capacity building. Contributions from the Foundation are (for the most part) limited to 40 percent of the total cost of infrastructure project costs. The need to find matching funds for the balance of the costs has presented serious challenges in the Atlantic region, mainly because of the region's limited provincial and industry matching capacity. That being said, the program has proven to be valuable for Canada and is one of the most significant initiatives ever undertaken by the federal government to help ensure that the Canadian research establishment remains internationally competitive.

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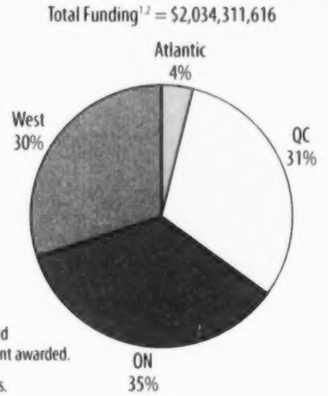
[73] Tamburri, R. (2003, April). "Women professors file complaint about research chairs program." *University News*. p. 25.

Distribution of Canada Foundation for Innovation Awards

As of April 2004, the Canada Foundation for Innovation funded 3,461 research infrastructure projects. Of these, 3,344 (or 97%) were awarded to member universities of the Association of Universities and Colleges of Canada (AUCC),[74] totalling over $2 billion. Figure 4.6 shows the distribution of this funding by region. Given their large representation in research funding in previous chapters, it is not surprising to see that Ontario (35%) and Québec (31%) were awarded the highest percentage of CFI funding. The Western provinces followed closely behind with 30% and Atlantic Canada accounted for the remaining 4%.

Figure 4.6
Distribution of Canada Foundation for Innovation Funding by Region



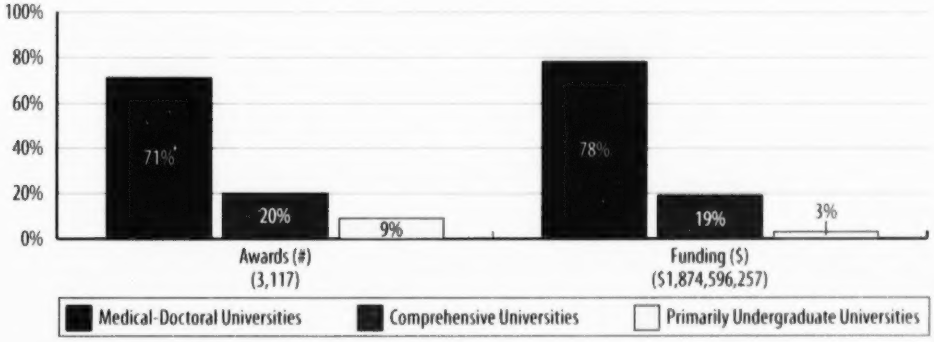
[1] Excluding national projects.

[2] One BC International Access Fund did not include the dollar amount awarded.

Source: CFI; author's calculations.

Distributions by university type follow the same pattern as evidenced in granting council and Canada Research Chairs distributions with medical-doctoral universities accounting for close to three quarters of the total number of awards given and amount of funding disbursed (Figure 4.7).[75] Primarily undergraduate universities accounted for a lesser proportion of CFI funding (3%) than number of awards (9%), with medical-doctoral universities making up most of that difference.

Figure 4.7
Distribution of Canada Foundation for Innovation Funding by University Type



Source: CFI; author's calculations.

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[74] As per the methodology outlined in Appendix A.

[75] The difference in funding totals between Figures 4.6 and 4.7 is a result of the limited number of universities included in calculations by university type.

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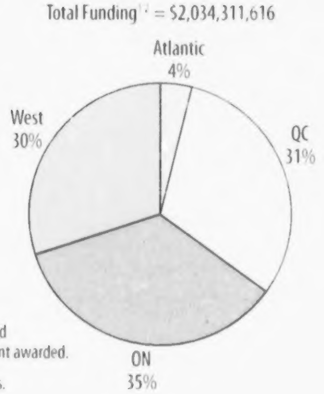

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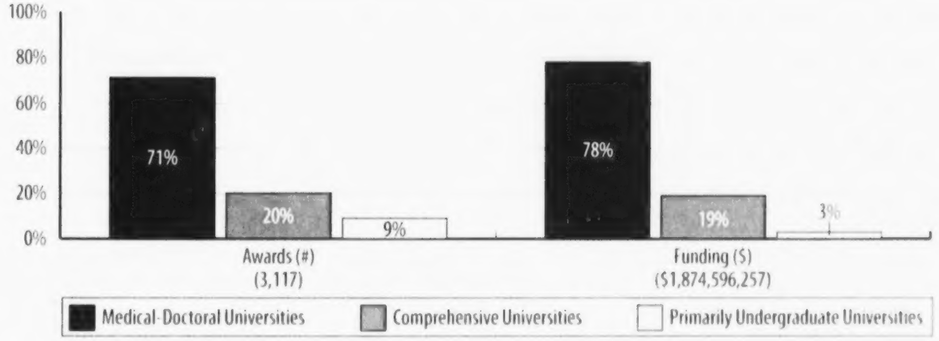

Source: CFI; author's calculations.

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[75] The difference in funding totals between Figures 4.6 and 4.7 is a result of the limited number of universities included in calculations by university type.

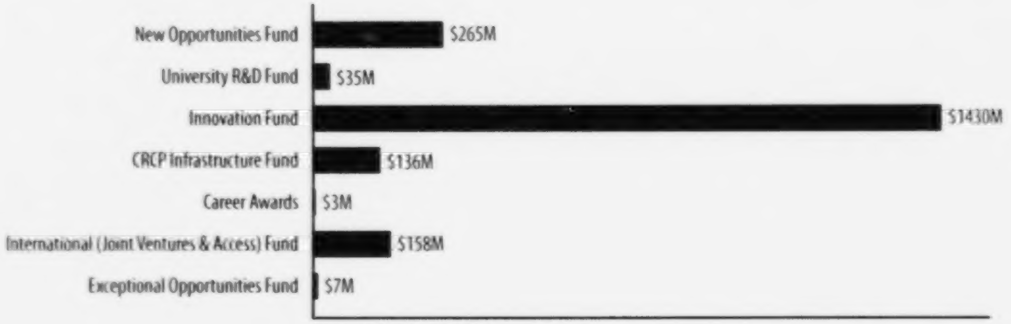
The key differences in proportion lie in the fact that each CFI funding mechanism does not operate in the same way. Furthermore, although eleven funds were in operation at some point since the program's inception, not all programs continue to operate nor were all accessed by every province.

Programs

The CFI offers a number of different funding mechanisms (as illustrated in Figure 4.8 below) to aid in the development of Canada's R&D infrastructure.[76] According to its policy guide, support from the CFI is awarded based on three main criteria: (a) quality of research and need for infrastructure; (b) contribution to strengthening the capacity for innovation; and (c) potential benefits of the research to Canada. Awards are (or have been) distributed through one of eleven funds[77] and through these funding mechanisms, the Canada Foundation for Innovation provided (as a maximum allowable) close to $3 billion to Canadian research infrastructure. Of this, 87% came through one of ten competitive awards, with the rest awarded through the Infrastructure Operating Fund.[78]

Of the total funding provided through the CFI's ten competitive awards, 85% ($2.03 billion) was awarded to an AUCC-member university. The following figure shows the distribution of this funding by mechanism[79] as of April 2004.

Figure 4.8
Funding Awarded by the Canada Foundation for Innovation by Mechanism



Source: CFI; author's calculations.

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[76] The CFI launched, in Spring 2005, a reorganization of its funding mechanisms resulting in the elimination, merging and/or addition of the types of awards it offers. For the 2006-2010 period, the CFI will provide funding primarily through five funds: the Leading Edge Fund, the New Initiatives Fund, the National Platforms Fund, the Leaders Opportunity Fund and the Infrastructure Operating Fund. The budget for these five funds is $750 million, plus interest, for 2006-2010. In addition to these programs, the CFI will continue to invest in infrastructure through the Research Hospital Fund and the International Joint Ventures Fund. A description of the new programs can be found at http://www.innovation.ca/whatsnew/dsp_news.cfm?newsid=146.

[77] A brief description of each can be found in related sections in this chapter with the exception of the *Research Hospital Fund* and the *College Research Development Fund* which are not included in the analysis as universities are not eligible to apply (as the principal proponent) to these funds. For more information on either of these funds, refer to the Canada Foundation for Innovation website.

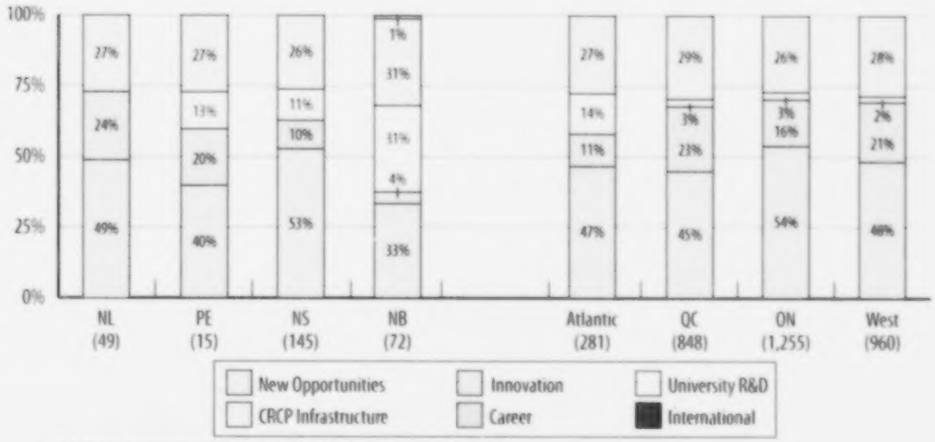
[78] The *Infrastructure Operating Fund* is designed not to fund an infrastructure project per se, but instead to help with the ongoing maintenance and operational costs that evolve out of CFI-funded projects. It does not require matching contributions; however, it does require proponents to submit, at the time of application, an outline of the anticipated operating costs of the proposed infrastructure project, for the first five years of operation, and how they plan to meet these costs. In so doing, the applicant is responsible for ensuring that it has the capability to maintain the CFI project for at least five years of operation. The Infrastructure Operating Fund helps with some of these incremental operating and maintenance costs.

[79] Excluding the *Research Hospital Fund* and the *College Research Development Fund* as universities are not eligible to apply (as the lead proponent).

Figures 4.9a and 4.9b confirm that the various funding mechanisms available from the CFI are not accessed equally by all provinces and that the type of CFI award received has a significant impact on the amount of funding received. In Figure 4.9a, one can see that the New Opportunities Fund was the most frequently used CFI award; however, Figure 4.9b shows that it did not account for the highest proportion of dollars awarded. Instead, the Innovation Fund accounted for the highest proportion of funding in all regions[80]—not surprising given the Canadian totals by mechanism as shown in Figure 4.8.

Figure 4.9a

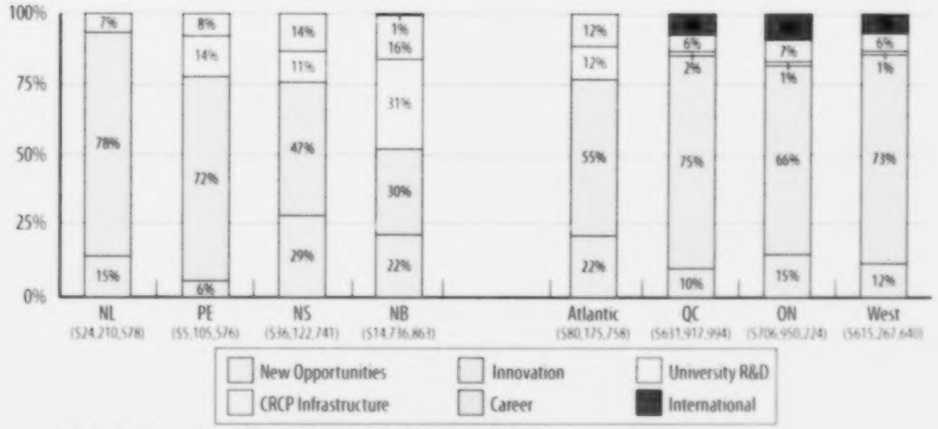
Distribution of University Projects Funded (#) via the Canada Foundation for Innovation by Funding Mechanism



* Only one award was granted through the Exceptional Opportunities Fund.
** Totals may not sum to 100% due to rounding.
Source: CFI; author's calculations.

Figure 4.9b

Distribution of Funding ($) Provided to Universities via the Canada Foundation for Innovation by Funding Mechanism



* The funding amount for one BC International Access Fund was not provided.
One award ($7,198,442) was granted through the Exceptional Opportunities Fund.
** Totals may not sum to 100% due to rounding.
Source: CFI; author's calculations.

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[80] And in all provinces but New Brunswick which received $4.4 million from the Innovation Fund and $4.6 million from the University Research and Development Fund.

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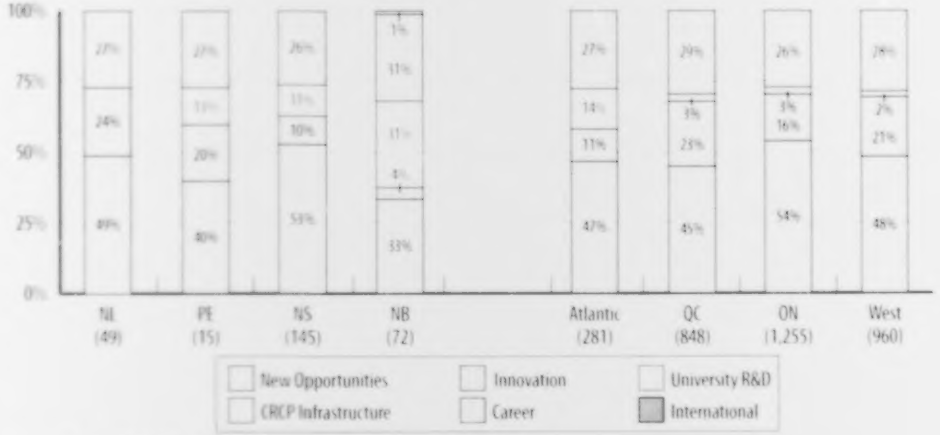

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Source: CFI; author's calculations.

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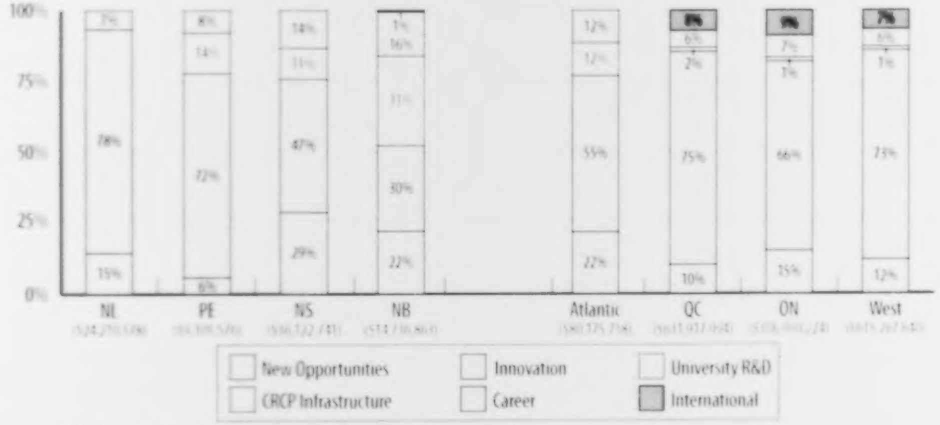

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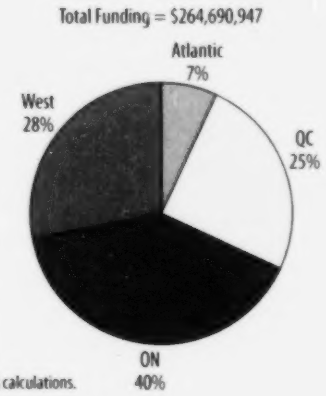
In the following sections, each funding mechanism is examined in more detail.

New Opportunities Fund

The *New Opportunities Fund* was established as a mechanism to help universities attract and retain high calibre researchers who would enhance the research environment in universities across Canada. These awards were available to eligible universities with maximum allocations pre-determined based on each institution's previous granting council success.[81] The Fund provided up to 40% of the eligible costs of infrastructure projects that support newly-appointed ("first, full-time academic appointment") faculty. Applications were assessed three times a year by at least one member of the "College of Reviewers" and one "Expert Reviewer" whose recommendations were then forwarded to the CFI Board for final decision. As of April 2004, 1,644 projects were approved under this fund, totalling close to $265 million dollars.

Of the 1,644 Canadian awards, the majority in Atlantic Canada originated in Nova Scotia (77 or 5% of the national total). As Figure 4.10 shows Ontario received the highest proportion of New Opportunities funding; however, the West (28%), not Québec (25%) as is the case in many instances, followed.

Figure 4.10
Distribution of New Opportunities Funding by Region



Source: CFI; author's calculations.

As was the case with all funding combined, medical-doctoral universities received approximately three quarters of funding through this mechanism while comprehensive universities accounted for 20% and primarily undergraduate universities, 4%, of New Opportunities funding.

University Research Development Fund

The *University Research Development Fund* was established to help universities and colleges who received very little in granting council funding enhance their research capacity. These universities received less than 1% of the total sponsored research funding for Canadian universities between 1994 and 1996. Since 2001, the University Research Development Fund[82] has been subsumed under the Innovation Fund[83] whereby, according to the CFI website, applications are categorized according to granting council success for review purposes but "there are no separate funds set aside for particular categories of institutions." As a result, while applications are first assessed in relation to those from like institutions, under the Innovation Fund, smaller institutions ultimately compete with medium and large institutions for a share of program funding—this was not the case (for this type of program) when the University Research Development Fund was active.

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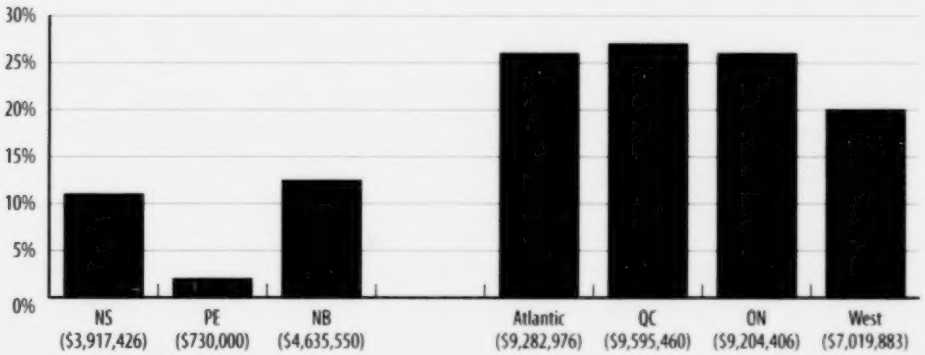
[81] That is, universities with a minimum average (over the previous three-year period) of $250,000 in sponsored research funding, from sources other than the CFI. These figures are calculated based on Canadian Association of University Business Officers (CAUBO) data.

[82] Along with the College Research Development Fund.

[83] Addressed in detail in the following section.

Through the University Research Development Fund, smaller universities were able to access approximately $36 million to help build research infrastructure. Due to the nature of the program, it could be expected that the Atlantic provinces would be more represented within this fund than in any other—and they were (26% of this program's funds went to this region). However, it is equally important to note that the distribution is Maritime, not Atlantic, as Memorial University of Newfoundland (MUN) did not receive funding under this program. This region's share was markedly higher than it had been with the New Opportunities Fund or any other CFI fund as shown in the following sections. Furthermore, for both New Brunswick (13%) and Nova Scotia (11%) these funding proportions were considerably higher than for any other CFI award.

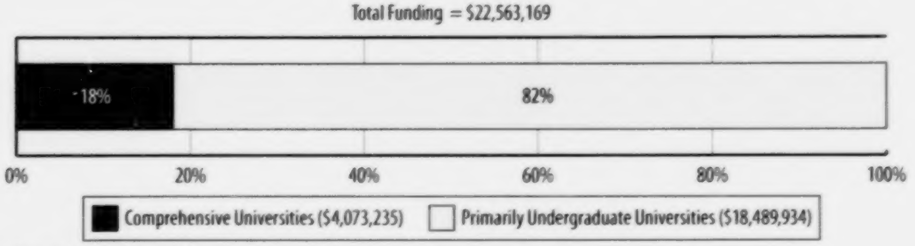
Figure 4.11
Proportion of University Research Development Funding Received by Canadian Universities, by Region and Atlantic Province



Source: CFI; author's calculations.

Taking into consideration that this fund was designed to help smaller universities access funding for research infrastructure, funding proportions by university type were expected to be significantly different than other CFI programs. Primarily undergraduate universities received more than 80% of University Research Development Funds. Medical-doctoral universities did not receive any funding under this mechanism while comprehensive universities accounted for the remaining 18%. In total, primarily undergraduate universities received funding in excess of $18 million dollars through this program—twice that received under the New Opportunities fund up to April 2004—a noticeable sum given that the fund was operational as a stand-alone program only until 2001.

Figure 4.12
Distribution of University Research Development Funding by University Type



Source: CFI; author's calculations.

Innovation Fund

The *Innovation Fund* provided funding to eligible universities, research hospitals, colleges and not-for-profit institutions to help them achieve the research priorities set out in their respective strategic research plans. For these infrastructure projects, the CFI encouraged collaboration within and outside the academic community to establish "clusters" or "networks" of related infrastructure to maximize CFI investment. Like other CFI programs, the Innovation Fund contributed up to 40% of the total eligible costs (with an expected minimum of $60,000 per project) with the remainder to be invested by other sources.

As alluded to in the previous section, applications to the Innovation Fund were first divided into three categories:

- *Category A:* Degree-granting institutions receiving more than 1% of federal granting agency funding; hospitals; not-for-profit organizations.
- *Category B:* Degree-granting institutions receiving less than 1% of federal granting agency funding.
- *Category C:* Colleges that do not confer degrees.

Proposals under each category were forwarded to one of several Multidisciplinary Assessment Committees (MACs)[84] who reviewed the proposal. Once all proposals were reviewed, projects deemed worthwhile to pursue in light of the CFI's overriding criteria were forwarded to the CFI Board which reviewed the top proposals from all categories (collectively). From there, the Board awarded funding to its selection of top projects, until the pre-determined budget reached its maximum.

In total, Canada's public universities received more than $1 billion dollars through the CFI's Innovation Fund. Given the large amounts awarded and the relatively lower number of projects funded, this mechanism could be considered the top CFI award as it provided substantial monetary support for large-scale infrastructure projects.

As of April 2004, 636 Innovation Fund projects were awarded to AUCC universities. Of these, 5% (32/636) were led by universities in Atlantic Canada with almost all projects led by institutions in Nova Scotia (14/636 or 2%) or Newfoundland & Labrador (12/636 or 2%).[85] In total, Atlantic Canada's universities received more than $44 million in Innovation Funds; a significant amount of funding yet still under 3% of the national total. For every other region, funding reached more than $450 million—approximately one third of the total.

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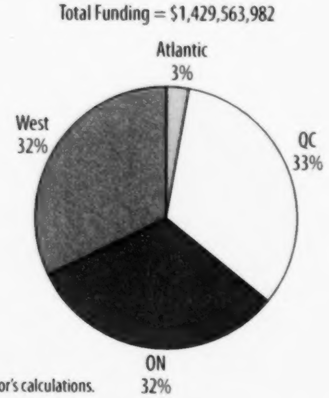
[84] For categories B and C, the CFI maintains that it gives special consideration to choosing members who understand the nature of research environments of smaller universities and colleges so that when assessing "the contribution for strengthening the research capacity for innovation" these differences can be taken into consideration. For all other criteria, the same standards apply across all categories.

Figure 4.13
Distribution of Funding Received through the Innovation Fund by Region

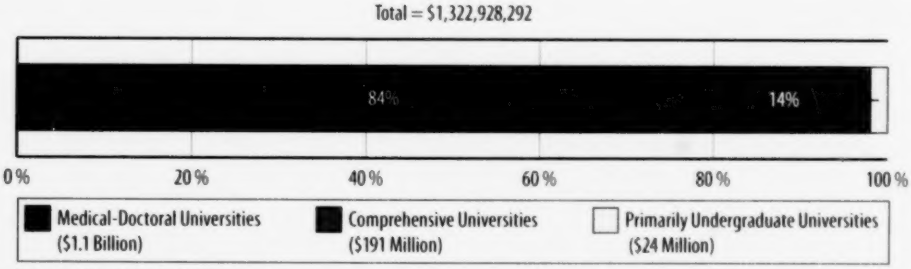


Source: CFI; author's calculations.

Given the magnitude of funds available under the Innovation Fund (the largest of all CFI funding mechanisms), it is important to recognize the impact a decrease or increase in proportion can have on actual dollars received. Under this funding mechanism, Atlantic Canada received 3% of the total dollars awarded. Within this context, an increase of just one percentage point would have equalled approximately $14 million. Thus even minimal success in increasing the region's proportion would result in an influx of funding not possible elsewhere. That being said, Atlantic Canadian universities were awarded more than $40 million in research infrastructure funding. This funding allowed for major projects, such as those described in Appendix C, to be developed—an achievement that should be acknowledged.

In looking at Innovation Funds by university type, Figure 4.14 shows that for those universities included in the university groupings, more than $1.3 billion was provided via the Innovation Fund. The majority of this amount was awarded to medical-doctoral universities (84% or $1.1 billion) with comprehensive and primarily undergraduate universities receiving substantial, but proportionately lower, amounts of funding (comprehensive universities = $191 million; primarily undergraduate universities = $24 million).

Figure 4.14
Distribution of Innovation Funding by University Type



Source : CFI; author's calculations.

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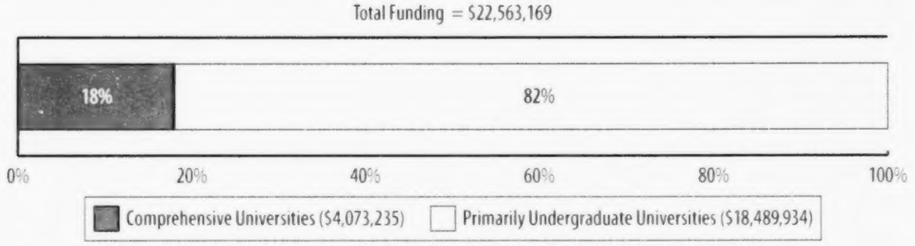
[85] Prince Edward Island and New Brunswick received funding through this mechanism; however, proportionately, these awards accounted for less than 1% of the total number of awards given (0.5% each) and of total funding disbursed (0.3% each).

Figure 4.12
Distribution of University Research Development Funding by University Type



Source: CFI; author's calculations.

Innovation Fund

The *Innovation Fund* provided funding to eligible universities, research hospitals, colleges and not-for-profit institutions to help them achieve the research priorities set out in their respective strategic research plans. For these infrastructure projects, the CFI encouraged collaboration within and outside the academic community to establish "clusters" or "networks" of related infrastructure to maximize CFI investment. Like other CFI programs, the Innovation Fund contributed up to 40% of the total eligible costs (with an expected minimum of $60,000 per project) with the remainder to be invested by other sources.

As alluded to in the previous section, applications to the Innovation Fund were first divided into three categories:

- *Category A:* Degree-granting institutions receiving more than 1% of federal granting agency funding; hospitals; not-for-profit organizations.
- *Category B:* Degree-granting institutions receiving less than 1% of federal granting agency funding.
- *Category C:* Colleges that do not confer degrees.

Proposals under each category were forwarded to one of several Multidisciplinary Assessment Committees (MACs)[84] who reviewed the proposal. Once all proposals were reviewed, projects deemed worthwhile to pursue in light of the CFI's overriding criteria were forwarded to the CFI Board which reviewed the top proposals from all categories (collectively). From there, the Board awarded funding to its selection of top projects, until the pre-determined budget reached its maximum.

In total, Canada's public universities received more than $1 billion dollars through the CFI's Innovation Fund. Given the large amounts awarded and the relatively lower number of projects funded, this mechanism could be considered the top CFI award as it provided substantial monetary support for large-scale infrastructure projects.

As of April 2004, 636 Innovation Fund projects were awarded to AUCC universities. Of these, 5% (32/636) were led by universities in Atlantic Canada with almost all projects led by institutions in Nova Scotia (14/636 or 2%) or Newfoundland & Labrador (12/636 or 2%).[85] In total, Atlantic Canada's universities received more than $44 million in Innovation Funds; a significant amount of funding yet still under 3% of the national total. For every other region, funding reached more than $450 million—approximately one third of the total.

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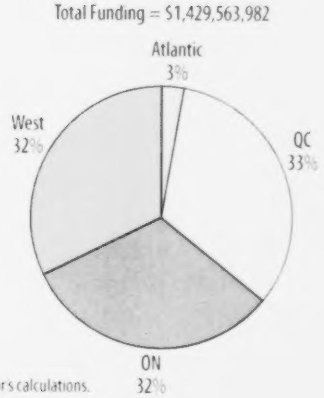
[84] For categories B and C, the CFI maintains that it gives special consideration to choosing members who understand the nature of research environments of smaller universities and colleges so that when assessing "the contribution for strengthening the research capacity for innovation" these differences can be taken into consideration. For all other criteria, the same standards apply across all categories.

Figure 4.13
Distribution of Funding Received through the Innovation Fund by Region



Source: CFI; authors calculations.

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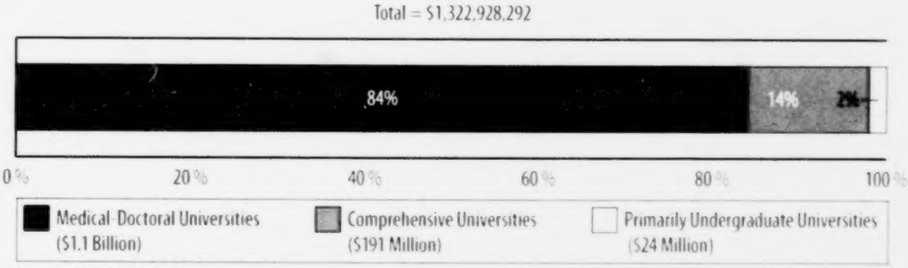

Source: CFI; authors calculations.

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[85] Prince Edward Island and New Brunswick received funding through this mechanism; however, proportionately, these awards accounted for less than 1% of the total number of awards given (0.5% each) and of total funding disbursed (0.3% each).

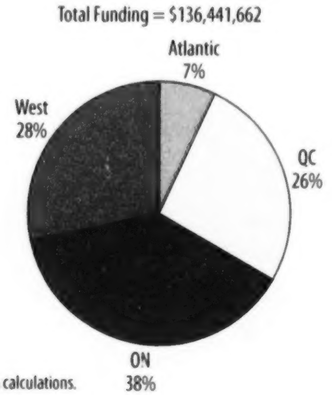
Canada Research Chairs Infrastructure Fund

Earlier in the Chapter (section 4.2), the Canada Research Chairs Program (CRCP) was described in detail. It was noted that Canada Research Chairs are recruited by universities in accordance with the number of Chairs allocated to them based on previous granting council success. These Chairs add to an institution's research capacity not only at the individual level but also on a larger scale acting as a catalyst for additional research and increasing the institution's sponsored research income (which is an important aspect for future awards). The Chairs can also enhance an institution's reputation once results of their research are made public. However, in filling a Canada Research Chair position, universities pay a price: they must finance the additional costs associated with supporting this researcher and his/her research pursuits. The Canada Foundation for Innovation helps alleviate some of these costs by providing infrastructure support to projects undertaken by the country's Canada Research Chairs.

The *Canada Research Chairs Infrastructure Fund,* therefore, works in collaboration with the Canada Research Chairs program. When universities submit nominations to fill a Chair position, they have the option to include a request for infrastructure funding. This funding is to directly support research conducted by Canada Research Chairs and is expected to reach $250 million, across Canada, by the end of 2005. As was the case with other Canada Foundation for Innovation Awards matching funding is required, with the CFI providing up to 40% of project infrastructure funding. Unlike other awards, however, this funding ceiling is raised for smaller universities.[86] Review of applications is the responsibility of the Canada Research Chairs Steering Committee which oversaw the nomination of Chairs; however, the CFI Board makes the final decision on the infrastructure request of successful Chair nominees.

As of April 2004, more than 900 CRCI awards were distributed across Canada totalling more than $136 million. Figure 4.15 shows the distribution of this funding by region and Atlantic province. Not surprisingly, Ontario (38%) accounted for the largest proportion of CRCI funding with the West (28%) and Québec (26%) accounting for the majority of remaining funds. Atlantic Canada again accounted for the lowest proportion (7%) of total funding; however this percentage is in line with its proportion of Canada Research Chairs.

Figure 4.15
Distribution of Canada Research Chairs Infrastructure Funding by Region



Source: CRCP; author's calculations.

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[86] Smaller universities, defined as those that received less than 1% of granting council funding in the previous three fiscal years, had two options when submitting their requests: (1) for projects exceeding $75,000 in total eligible costs, the 40% maximum contribution applied and (2) if the project's eligible costs were less than $75,000, the CFI may have contributes up to 100% of eligible costs.

As was the case with Canada Research Chairs, medical-doctoral universities received more than three quarters (76%) of all CRCI funding. Comprehensive universities accounted for less than one fifth of the total ($23 million or 18%), while primarily undergraduate universities received the remaining 6% ($7 million).

Career Awards

In an effort to further recognize the achievements of the granting councils' career award recipients, the CFI developed, in partnership with two of the granting agencies, an award designed to support the work of outstanding researchers within each council's group of disciplines (NSERC = Steacie Fellowship, CIHR = Distinguished Investigator).

Each year, host institutions of Steacie Fellowship (usually up to six annually) and CIHR Distinguished Investigator (usually up to five annually) recipients submit a request for infrastructure support from the CFI's $1 million *Career Award* fund. Proposals are reviewed by a select number of members from the original granting council committees who reviewed the initial award nominations, who then make a recommendation to the CFI based on the CFI's general criteria (quality of research and need for infrastructure, contribution to strengthening the capacity for innovation and the potential benefits of the research to Canada).

In Atlantic Canada, one researcher received this type of funding (a researcher in a New Brunswick university). This is a noteworthy accomplishment as only 12 awards, in just four provinces: Ontario, Québec, Alberta and New Brunswick, were awarded across Canada. Of these 12 awards, nine were given to researchers in medical-doctoral universities and 3 to researchers in comprehensive universities.[87]

Through these awards, Steacie Fellowship and CIHR Distinguished Investigator recipients received just under $3 million to support research infrastructure costs. Ontario and Québec received the highest number of awards, and as a result, the largest portions of total funding (48% and 31%, respectively).

International Joint Ventures and International Access Funds

In 2001, the CFI announced the creation of two international funds: the International Joint Ventures Fund and the International Access Fund. Both were created as one-time investments to enhance and support the country's ability to collaborate with leading researchers around the world.

As stated on the program website, the *International Joint Ventures Fund* was designed to support "the establishment of a small number of very high profile research infrastructure projects in Canada to take advantage of extraordinary research opportunities with leading facilities in other countries that will bring significant benefits to Canada…The *International Access Fund*…provides access for Canadian institutions and their best researchers to facilities in other countries and major international collaborative programs. They will perform innovative research through unique collaborative research opportunities that will lead to significant benefits to Canada."

Through the utilization of $200 million ($100 million for each fund), the CFI proposed to support up to 100% of eligible project costs, with institutions also encouraged to seek out partnering support. Under this fund, nine projects were approved (International Joint Ventures Fund = 3; International Access Fund = 6) totalling more than $158 million dollars.[88] None of these funds were awarded to an Atlantic institution. Of the universities included in the scope of this report by university-type groupings, eight awards were given: five to medical-doctoral universities and three to comprehensive universities. As was the case with Career Awards, primarily undergraduate universities did not receive any funding through this CFI mechanism.

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[87] No CFI career awards were given to a researcher in a university identified as a primarily undergraduate university.

Exceptional Opportunities Fund

In recognizing that there may be times when an opportunity could be missed if quick action is not taken, the CFI identified the *Exceptional Opportunities Fund* as a "rapid response mechanism" to provide funding to projects that required immediate attention in order to go forward. Projects submitted to this fund were expected to be very infrequent and were to be assessed based on the need for urgency which could otherwise result in loss of funding for the project.

As of April 2004, one such project at a medical-doctoral university in Ontario was funded by the Foundation. The CFI's contribution was approximately $7 million.

Impact of the CFI in Atlantic Canada

Clearly, the Canada Foundation for Innovation is a major player in Canadian R&D. Having awarded close to $3 billion in just five years, CFI funding was (and continues to be) a substantial resource advancing the nation's R&D infrastructure. However, despite its strengths, one of its major downfalls is the requirement of matching funds. While smaller institutions were taken into consideration with the development of University (and College) Research Development Funds, after 2001 this mechanism was no longer available to universities. Further still, the programs that considered smaller institutions into their funding formulas (at least in the sense that they secured less in granting council funding) were fairly limited. For the most part, universities in all regions must secure matching funding if they are to access CFI dollars. In Atlantic Canada this is a major hurdle as there are no specific funding envelopes set aside to adequately meet these needs.

While many of the provincial initiatives (discussed in the following chapter) have provided some matching funding; most are not designed for that express purpose. Further still, while increased provincial investment is apparent within Atlantic Canada (also described in Chapter 5), provincial governments face added pressure to invest more in matching funding initiatives so that researchers and research institutions are not engaged in a constant negotiation process to secure matching funds from other public and private partners—which is a considerable obstacle in this region as there are fewer potential funding partners than in other R&D-intensive regions. More specifically, forging private sector partnerships is particularly difficult for Atlantic Canadian universities given the small-to-medium nature of businesses in the region.

4.4 The Indirect Costs Program

As outlined at the beginning of the chapter, in working to increase Canada's research capacity, and its ability to compete within a knowledge-based economy, the federal government implemented new research-based initiatives (such as the Canada Research Chairs program and the Canada Foundation for Innovation) and increased its funding allocations to the three granting councils to help researchers obtain the capital they need to get a project underway and/or to move it toward commercial applications. Despite their positive features, these programs have put pressure on universities, one of Canada's most research-intensive sectors (and the key sector in Atlantic Canada), to invest in R&D and to help their researchers maximize potential funding.

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[88] Funding amount for one International Access Fund (awarded to a British Columbia researcher) was not available.

The drive to increase research productivity has taken its toll on universities' core operating budgets as funding from these new initiatives largely go toward the projects themselves and are not applicable to some of the costs that indirectly arise from increased research activity.

In an effort to help universities defray the indirect costs of research, in 2001–2002, the federal government committed $200 million as a one-time payment to cover some of these costs. In its 2003–2004 budget, the government extended and expanded upon this initial investment announcing the program's continuation as an annual federal program.

According to the Indirect Costs program's website, indirect costs "refers to the central and departmental administrative costs that institutions incur to support research, but are not attributable to specific research projects. The Indirect Costs program does not fund: direct costs of research projects, including the salary of the principal investigator; direct and indirect costs of educating students; indirect costs supported by the Canada Research Chairs Program; the operating costs for research infrastructure claimed and funded by the Infrastructure Operating Fund of the Canada Foundation for Innovation; and capital expenditures."[89] By financing a portion of these costs, the federal government recognizes that universities are responding to growing demand for publicly-funded research, but that they need help in maximizing returns for research investments.

Administered by the CRCP Secretariat, the Indirect Costs program was intended to help all institutions by providing financial support to meet the needs of both large and small institutions. The Indirect Costs program works to help Canadian researchers be actively involved in, and have access to:

- well-equipped research facilities
- world-class research resources, that will foster multi-disciplinary research and international collaboration
- strategic management and efficient administration of the institution's research enterprise
- fulfilment of international regulatory and accreditation requirements
- effective management of intellectual property generated through research

As explained on the program website, Indirect Costs awards are granted for one year and are based upon an institution's previous granting council success for the most recent three-year period (for example, for the fiscal year 2003–2004, eligibility is determined and allocations are calculated using data for the fiscal years 1999–2000, 2000–2001, and 2001–2002) and have a ceiling of 80% of the average value of total research grants (amount paid) with funding percentages decreasing as previous granting council success increases.

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[89] www.indirectcosts.gc.ca/home_e.asp

The following table (Table 4.1) illustrates the funding formula for the Indirect Costs program:

Table 4.1
Indirect Costs Program Funding Formula

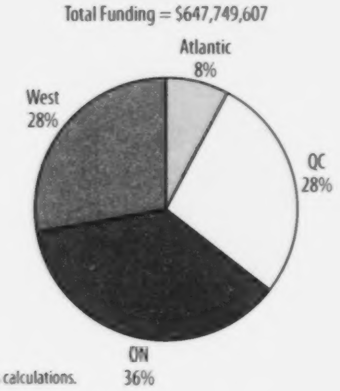
Average Revenues from NSERC, SSHRC or CIHR Research Grants	Percentage of Indirect Costs
First $100,000	80
Next $900,000	50
Next $6 million	40
Balance	Percentage calculated annually, based on the total amount available; approximately 20% in the first year

Source: www.indirectcosts.gc.ca/home_e/asp (Table 1).

Funding by Region and University Type

Figure 4.16 shows the distribution of these funds since the government's first investment in 2001-2002. Over the three years of operation (2001-2002, 2003-2004, 2004-2005), the Indirect Costs program awarded nearly $650 million to help defray the indirect costs of research. Of this, Ontario received the largest proportion accounting for more than one-third of the total (36%) with Québec and the West each receiving 28% of total funds. The Atlantic provinces accounted for the final 8%—a respectable amount given the region's reported granting council levels—with the Maritime provinces making up more than three quarters of the Atlantic proportion (Maritime = 78% of the Atlantic total and 6% of the Canadian total).

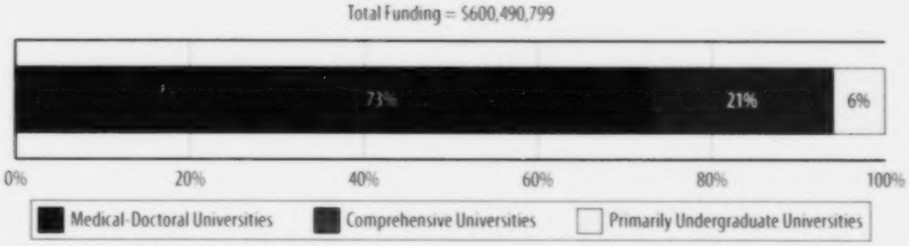
Figure 4.16
Distribution of Indirect Costs Funding by Region



Source: Indirect Costs Program; author's calculations.

Looking at Indirect Costs funding by university type (Figure 4.17) one can see that medical-doctoral universities received just under 3/4 of total funding (73%). Comprehensive universities received approximately 21% and primarily undergraduate universities, 6%. Funding for the latest fiscal year (2004-2005) averaged $10 million for medical-doctoral universities, $4 million for comprehensive universities and $560,000 for primarily undergraduate universities.

Figure 4.17
Distribution of Indirect Costs Funding by University Type



Source: Indirect Costs Program; author's calculations.

The funding formula embedded in the Indirect Costs program, which provides higher percentages of funding at lower levels of granting council funding, appears to favour smaller, primarily undergraduate institutions. Recalling that the Maritime post-secondary sector is largely comprised of primarily undergraduate universities, one could also conclude that the funding formula is beneficial for the Maritime region.

4.5 New Initiatives from the Atlantic Canadian Perspective

Atlantic Canada has made use of most of the funding mechanisms available under the new initiatives launched by the federal government in its 2002 Innovation Strategy. The successes achieved to date with the assistance of these programs have been remarkable (some examples of which are given in Appendix C) but nevertheless have not met the region's expectations.

Several of the newest federal R&D initiatives require matching funding. This presents a significant challenge to Atlantic Canada's universities for two main reasons. First, the region's private sector, consisting primarily of small-to-medium size industries, has limited resources to devote to R&D, resulting in a limited pool of potential funding partners. Second, while elsewhere in the country provincial governments have stepped in to provide matching funds for these federal research funding initiatives, in Atlantic Canada this type of support is relatively new and considerably limited.

Demonstration of previous granting council success, the second criterion common to most funding programs, also presents challenges in Atlantic Canada as the region's universities, of which the majority are primarily undergraduate, do not have the R&D foundation evident in larger, more research-intensive universities.

The Canada Research Chairs Program, a program with its foundation in previous granting council success, is not designed to adequately respond to this region's structural differences in post-secondary composition nor to the need to build a much stronger set of clusters of researchers. Although special allocations are an important step in assisting smaller institutions to obtain a Canada Research Chair, criteria for allocation ought to be reconsidered in light of the need for primarily undergraduate universities to build rather than simply enhance their R&D systems. Further, the region might also benefit if critical reflection were to occur on the need to compete with all other institutions in attracting and retaining these top and promising researchers. For primarily undergraduate universities, this inherent component of the Canada Research Chairs program surely places them at a disadvantage as they cannot offer the research infrastructure (physical infrastructure, external collaborators, easy access to faculty in the same specialized areas of research, etc.) that is available in larger institutions.

The CFI has also instituted specific measures to respond to the needs of smaller universities and regions. The bottom line however is that the Innovation Fund (the largest and most important of the CFI programs) has not produced proportional results in Atlantic Canada. Further, the integration of the University Research Development Fund into this broader Innovation Fund will likely be detrimental to Atlantic Canada's universities. Thus the CFI also does not adequately account for the needs of the nation's smaller universities.

As noted above, even with its reliance on past granting council successes to determine eligibility, the Indirect Costs program appears to be most in line with the needs of Canada's smaller universities because it incorporates a staggered funding formula. This formula provides a higher percentage of eligible costs to universities with the lowest levels of granting council funding.

The following chapter examines the Atlantic Innovation Fund, another federally-created program, designed to offset some of the challenges faced by Atlantic Canada's researchers. Prior to this however, the chapter first describes some of the provincial research initiatives available in each Atlantic province that support researchers attempting to access funding from the federal research funding environment.

Chapter 5—*Provincial and Region-Specific Initiatives:*

findings

Supporting *Atlantic Canada*

- Research investments differ within the Atlantic provinces. For example, when comparing GERD (gross domestic expenditures on R&D) in 1995 and 2002, it is clear that the provinces with the highest levels of R&D funding remained the highest seven years later, although their percentage growth had been smallest.

- On a per capita basis, a similar trend occurs with respect to Nova Scotia and Prince Edward Island (NS had the highest amount of GERD per capita, the second lowest amount of growth; PE had the highest growth, lowest GERD per capita); however, Newfoundland and Labrador's population decrease between 1995 and 2002 resulted in a shift in the middle ranks of R&D expenditures and expenditure growth.

	GERD ($ In Millions*)		Growth in Funding (%)	GERD Per Capita*		Growth in Per Capita Funding (%)
	1995	2005		1995	2002	
NS	215	353	64	231	378	64
NB	114	174	63	151	232	54
NL	81	140	73	143	270	89
PE	13	30	131	97	214	121

*Constant dollars.

- In Atlantic Canada, each provincial government, in varying ways, provides financial assistance for university research. These sources of support include matching funding initiatives, discipline-specific funding (e.g., health-related initiatives) as well as programs designed to foster collaboration among universities and other sectors, particularly industry. However, the investment by Atlantic provincial governments is considerably lower and relatively recent in comparison to other Canadian provinces resulting in fewer R&D opportunities for Atlantic Canada's researchers. Further still, although funding for the most recent provincial government initiatives are not yet reflected in national level data, preliminary analyses suggest the region's provincial governments will face added pressure to increase investments in university R&D, particularly through matching funds for federally-based programs such as those described in Chapter 4.

- Atlantic provincial governments have increased R&D spending; however, the rate of investment has been slower than for the country as a whole (Atlantic Canada=55%; Canada=176%).

- The Atlantic Canada Opportunities Agency (ACOA) is an important component of the region's R&D environment. Through the Atlantic Innovation Fund (AIF), ACOA has provided funding for more than 100 collaborative, Atlantic-based, research projects. Despite this success, the program continues to face challenges in bringing the two main parties' (university and business) research goals and practices together.

5.1 The Provincial Picture: A Synopsis of Funding in Each Atlantic Province

Although the focus of this report is regional, analysis of each Atlantic province can be beneficial to understanding what comprises the regional picture. It can also be beneficial to Commission stakeholders in positioning individual provinces within the Atlantic context—much like this report situates Atlantic Canada within the national context.

This chapter directs attention toward research funding in each Atlantic province by first providing a very brief synopsis of the main data presented in the previous chapters. Section 5.2 then describes some of the initiatives implemented by each provincial government with respect to increasing innovation and university R&D specifically. Section 5.3 broadens the provincial-level analysis by examining provincial government investment at the regional level to situate funding from Atlantic Canada's provincial governments (as a collective and individually) within the national context. Finally, Section 5.4 describes region-specific funding designed to offset some the challenges faced by Canada's regions with respect to the economy and particularly Atlantic Canadian R&D.

Each provincial synopsis[90] draws comparisons between data[91] from the 2000 *Report on Post-Secondary Research Trends* and the latest data provided in this report for four key measures: gross domestic expenditures on R&D (GERD), GERD per capita, primary sources of R&D funding and granting council income (NSERC, SSHRC, CIHR, Total). They also summarize where each province stands in relation to the Atlantic region as a whole with respect to two of the newest R&D initiatives (CRCP and CFI).

New Brunswick

- Gross domestic expenditures on R&D remained second only to Nova Scotia for the province of New Brunswick (1995=$114 million, 2002=$174 million).
- On a per capita basis, R&D expenditures increased 54% between 1995 and 2002, increasing from $151 to $232.
- In 1995, this funding was primarily from the federal government (43%) with the business sector accounting for the next largest proportion (26%). By 2002, proportions by funding sector shifted as the higher education sector met federal government spending (accounting for 36% of the total each) while business sector expenditures increased less, resulting in a decrease in this sector's proportion (20%) of the total.
- With respect to granting council income, New Brunswick by far experienced the largest amount of growth within a single council (CIHR funding was more than 75 times higher in 2002–2003 than it had been in 1997–1998);[92] however, as a granting council total, the province showed the lowest growth (78%) increasing from over $5 million in 1997–1998 to nearly $10 million in 2002–2003. SSHRC income more than doubled (135%) between 1997–1998 and 2002–2003 increasing to over $1 million dollars; while funding from NSERC increased less dramatically (57%), but remained the province's greatest source of granting council funding (1997–1998=approximately $5 million, 2002–2003=nearly $8 million).

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[90] For additional information on sponsored research income by province refer to Appendix B .

[91] Where dollar amounts are given, constant dollars are used.

[92] New Brunswick in particular showed a considerable amount of fluctuation in MRC/CIHR income. In 1997-1998, the province received only $9,000 from the MRC. In the following year, it received more than $100,000 but returned to approximately the same level as in 1997-1998 in the following year ($10,000). In 2002-2003, the province received close to $1 million ($695,000). These data are shown, over time, in Appendix B .

- One quarter (24/94) of Atlantic Canada's Canada Research Chairs were employed in New Brunswick universities.
- Nearly one-fifth (18% or $15 million) of Atlantic CFI funding was awarded to a university in New Brunswick. This funding came largely from the University Research Development Fund and the Innovation Fund. Additional money was also provided through New Opportunities and Canada Research Chairs Infrastructure Funds with approximately $100,000 awarded through the Career Awards program (NB was the only Atlantic province to receive funding through this program).

Newfoundland and Labrador

- Between 1995 and 2002, R&D expenditures in Newfoundland and Labrador increased 73% from approximately $81 million to more than $140 million.
- On a per capita basis, R&D expenditures increased 89% during this same period, from $143 in 1995 to $270 in 2002.
- The key sources of R&D funding in 1995 remained the same in 2002: Federal Government (1995=42%, 2002=41%) and Higher Education (1995=35%, 2002=36%).
- Granting council income grew 146% between 1997-1998 and 2002-2003 (from $6 million to nearly $16 million). This growth was largely found in SSHRC (+345% from $278,000 to more than $1 million) and CIHR (+316% from $1 million to more than $4 million) funding, with NSERC income also very strong having doubled between 1997-1998 ($5 million) and 2002-2003 ($10 million).
- As of November 2004, Newfoundland and Labrador was home to 15 of the 94 Canada Research Chairs located in Atlantic Canada. In relation to the Atlantic total, these Chairs account for 16%.
- Newfoundland and Labrador received more than $24 million dollars through the CFI with this funding coming through three mechanisms: the Innovation Fund, the New Opportunities Fund and the Canada Research Chairs Infrastructure Fund, respectively. The province received 30% of Atlantic CFI funding.

Nova Scotia

- As expected, Nova Scotia's R&D expenditures remained the highest of the Atlantic provinces increasing from $215 million in 1995 to $353 million in 2002.
- On a per capita basis, R&D expenditures increased 64% between 1995 and 2002, from $231 to $378.
- The primary funding sectors remained the same over time (federal government and higher education); however, the proportions shifted several percentage points as the higher education sector met federal government expenditure levels (1995—federal government=43%, higher education=26%; 2002—federal government=35%, higher education=34%).
- Nova Scotia also reported the highest level of total granting council funding, more than doubling its income between 1997-1998 ($16 million) and 2002-2003 ($34 million). SSHRC income grew the most during this period (305%) increasing from just over $1 million to more than $4 million. As was the case in 1997-1998, Nova Scotia's granting council income was the highest in the Atlantic provinces within each granting council (NSERC—1997-1998=$11 million, 2002-2003=$19 million; CIHR—1997-1998=more than $4 million, 2002-2003=nearly $10 million).

- Nova Scotia's universities employed more than half (55% or 52/94) of Atlantic Canada's Canada Research Chairs.
- With more than $36 million in total, the province also received nearly half (45%) the region's CFI funding. This funding, as was the case with the previous three provinces, came largely from the Innovation Fund with the New Opportunities, Canada Research Chairs Infrastructure and University Research and Development Funds accounting for the remainder.

Prince Edward Island

- Gross domestic expenditures on R&D in Prince Edward Island more than doubled between 1995 and 2002 increasing from $13 million to nearly $30 million dollars.
- On a per capita basis, R&D expenditures also more than doubled (121%) between 1995 ($97) and 2002 ($214).
- Whereas the federal government accounted for more than two-thirds of this funding in 1995, its proportion, while still very high, considerably decreased by 2002 resulting in equal proportions between this sector and the higher education sector (42% each) in the final year of reporting. The business sector, the only other source of R&D funding in Prince Edward Island, decreased in proportion, from 16% in 1995 (second highest) to 13% in 2002.
- Within the Atlantic provinces, Prince Edward Island experienced the largest growth in granting council income (288%) although actual funding remained the lowest in the region (1997–1998=$520,000; 2002–2003=$2 million). The greatest increase was in CIHR income where the 2002–2003 amount ($536,000) was more than 10 times higher than in 1997–1998 ($48,000). NSERC and SSHRC income also grew considerably. NSERC income nearly tripled between 1997–1998 and 2002–2003 increasing from $399,000 to over $1 million, while SSHRC income was more than four times greater in 2002–2003 ($299,000) than it had been in 1997–1998 ($73,000).
- Prince Edward Island employed three Canada Research Chairs representing 3% of the Atlantic total.
- In total, the province received more than $5 million from the CFI with this funding awarded through four of the program's funding mechanisms: the Innovation Fund, the University Research Development Fund, the Canada Research Chairs Infrastructure Fund and finally, the New Opportunities Fund. In relation to the Atlantic total, Prince Edward Island received 6% of the more than $80 million awarded.

The above summaries show that within Atlantic Canada R&D income varies considerably. While the higher education sector is heavily involved in all four provinces, levels of R&D expenditures and income vary. This variation is important to consider as these data can influence funding designed to enhance R&D and innovation at the provincial level. The following section explores some of the measures taken by each Atlantic provincial government in an effort to meet some of its university R&D needs.

5.2 An Increase in Atlantic Provincial Investment and Innovation Planning

The following data show that the Atlantic provinces have stepped up to the plate in terms of setting aside specific funding for PSE R&D. Each province, using different approaches, provides financial assistance for university research through initiatives intended to assist in meeting the matching funding requirements of federal programs, foster increased discipline-specific research (e.g.. health-related initiatives) as well as encourage collaboration among universities and other sectors, particularly industry.

The following paragraphs begin with an examination of provincial investment in the Atlantic provinces outlining some of the newest initiatives available in each province under their respective provincial governments.[93] It then looks at this investment within the broader national picture revealing that despite the increase in investment, the Atlantic provinces still lag behind other Canadian provinces who have increased their R&D investments by even greater proportions.

New Brunswick

In February 2002, Premier Bernard Lord unveiled the province's ten-year strategy, *Greater Opportunity: New Brunswick's Prosperity Plan, 2002–2012* which focuses on the "economic fundamentals" of innovation, productivity and export orientation and is supported through four interrelated building blocks: Investing in People, Creating a Competitive Fiscal and Business Environment, Embracing Innovation, and Building Strategic Infrastructure.

In advancing this Prosperity Plan, the province developed strategic plans for each of the building blocks. *Greater Opportunity: An Innovation Agenda for New Brunswick* addresses the notion of "Embracing Innovation." In it, the province outlines its top 10 priorities under their innovation agenda. While the realization of each will impact university R&D in some capacity, two priorities have had a direct impact: the establishment of an Innovation Foundation (New Brunswick Innovation Foundation) and the creation of the University Infrastructure Trust Fund (UITF).

New Brunswick Innovation Foundation (NBIF)

A central feature of the province's plan was the creation of the *New Brunswick Innovation Foundation (NBIF)*. Through a $20 million dollar investment by the provincial government,[94] the NBIF was established in 2002 as an independent non-profit corporation. To meet its mandated functions (as outlined in the *Greater Opportunities* document), the Foundation financially supports research and development through four key funds: The Enterprise Innovation Fund, The Venture Capital Fund, The Research Innovation Fund and The Business Incubator Fund. Programs in Partnerships is another investment fund through which NBIF, in partnership with other provincial bodies (namely the Department of Training and Employment Development and the Department of Education), assists academic research. Each of the five funds focus on, but are not restricted to, research in the areas of advanced manufacturing, knowledge industries, life sciences and value-added natural resources.[95]

While The Enterprise Innovation Fund, The Venture Capital Fund and The Business Incubator Fund concentrate on private sector research, The Research Innovation Fund and the Programs in Partnerships are directed specifically to the academic community.[96] As of Fall 2004, close to half a million dollars had been levied into research and development through the Research Innovation Fund and close to $6 million had been invested via the two main programs of Programs in Partnerships: the Research Technicians Initiative

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[93] This section is not to be considered a comprehensive list of provincial government investment into R&D. It describes several university-relevant research funding initiatives that are developed and promoted as part of an innovation strategy and/or those identified by stakeholders in the consultation process for this report.

[94] In the province's 2005 Budget announcement, an additional $5 million was committed to the NBIF.

[95] These areas are identified as strategic clusters within the innovation agenda; for Phase 2 of the Research Assistantship Initiative (RAI), education and training is also identified as a strategic priority.

[96] For a complete description of each fund, and awarded projects within each, refer to the NBIF website: www.nbif.ca.

(RTI = $1.5 million) and the Research Assistantships Initiative (RAI = Phase 1—$1 million; Phase 2—$2.9 million).

University Infrastructure Trust Fund (UITF)

In the 2002-2003 budget, the province committed a one-time investment of $15 million as a further stimulus for investment and innovation. The New Brunswick government projected that the *University Infrastructure Trust Fund* would assist in "ensuring research excellence and improving the teaching and research capacity of the province's universities." The $15 million investment was divided into two envelopes resulting in a two-stage process for the distribution of funds (Phase 1 = $10 million; Phase 2 = $5 million). For both phases, the province's four public universities were awarded funding based on their proportion of provincial operating grants for the 2001-2002 fiscal year (Mount Allison = 10%; St. Thomas University = 5%; Université de Moncton = 31%; University of New Brunswick = 54%). In Fall 2004, a Call for Proposals was sent out for universities to apply for funding under Phase 2 of the Trust Fund and in March 2005, the provincial government announced an additional investment of $20 million to this program.

Research Development Fund (RDF)

Through the *Research Development Fund (RDF)*, the province of New Brunswick also provided funding to help universities build their R&D capacity. Between 2001-2002 and 2003-2004, universities were provided a total of $1.2 million ($400,000 each year over three years) to develop strong research proposals and improve their ability to win funding from the major granting councils. Each year, this funding was disbursed among the four universities in the following allotments: Mount Allison University ($60,000), Université de Moncton ($120,000), University of New Brunswick ($200,000) and St. Thomas University ($20,000).

Quality Learning Agenda: Quality Post-Secondary Opportunities

As part of the *Greater Opportunity* prosperity plan, the New Brunswick government has also developed strategic plans for the "Investing in People" building block. Within this forum, the government put forth a *Quality Learning Agenda* that focuses "strongly on raising academic achievement and excellence, improving quality teaching, and ensuring greater accountability..." One of the stepping stones identified as a component of achieving the strategies set out within this agenda[97] is "Post-Secondary Education and Training" which is particularly important within the context of university research as it includes research-related targets for the next 10 years.

Quality Post-Secondary Opportunities, released in April 2005, is the planning document that outlines the strategies and priorities for the post-secondary sector over the next 10 years. In it, seven key objectives are identified including one that is specific to post-secondary research—to increase research and innovation capacity. To meet this objective, the government set two main targets:

(1) New Brunswick will join the top four provinces in Canada in Research and Development expenditures per capita.
(2) New Brunswick post-secondary institutions will increase their share of federal research awards equivalent to the province's share of the Canadian population.

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[97] Related documents available on the website: www.gnb.ca/0000/qla-e.asp

In striving to meet these objectives, the province outlines several courses of action that it will undertake, in the shorter and longer term, to help achieve these ends, including: developing a strategy to improve New Brunswick's success rate in federal research awards; continuing to enhance partnerships among and between the public and private sectors; developing a work-study initiative for graduate students; and launching an Annual Innovation Forum.[98]

New Brunswick Provincial Health Plan

The government of New Brunswick also invests funding specifically for health and health-related research. In *Healthy Futures: Securing New Brunswick's Health Care System* (2004), the government states that "there is more to health care than physical infrastructure and qualified practitioners. Providing the best possible health services also requires research into the medical, behavioral and socio-economic issues that have an impact on the health and wellness of New Brunswickers." In light of this stance, the provincial government committed to several core activities for the 2004–2008 planning period. These activities include: "…commitment of approximately $3 million for health research; an annual grants competition which will replace the current Medical Research Fund of New Brunswick…;[99] a capacity-building initiative that will provide support for promising researchers; a knowledge-transfer program designed to help translate research into public policy and informed decision making; and a 'matching funds' program that will support research projects that have received partial funding from external sources." Each of these programs will help build New Brunswick's health research capacity.

Newfoundland and Labrador

In 2004, the Government of Newfoundland and Labrador announced its intention to develop an innovation strategy that would help set the path for the future of economic development in the province. To foster collaboration in the development process and increase input from its key stakeholders, the government released, in February 2005, *Newfoundland and Labrador's Blueprint for Sustainable Economic Growth through Innovation: A Discussion Paper.*[100] In it, the province explains that a provincial innovation strategy "cannot be developed and owned solely by the provincial government. It must be the province's blueprint. It must reflect the needs of all stakeholders including education and training institutions, small and large businesses, labour, technology industries, the resource sector, cultural organizations, communities and the government sector." As such, the government engaged in a consultation process to encourage input in the development of a provincial strategy. In Spring 2005, the consultation process concluded, with a final report on these consultations to be released soon thereafter. Building from this consultation document, the government of Newfoundland and Labrador expects to release a provincial innovation strategy in late 2005.

Apart from the forthcoming innovation strategy, the province of Newfoundland and Labrador has directly supported university R&D through its Industrial Research and Innovation Fund (IRIF) and the Centre for Applied Health Research.

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[98] A detailed list of government action can be found on pages 35-36 of the *Quality Post-Secondary Opportunities* document.

[99] The Medical Research Fund of New Brunswick was implemented to provide financial assistance for health-related research in the province. Projects were to be completed within a 12-month period and could be funded up to a maximum of $25,000. Recipients of 2003 awards received nearly $114,000 with close to two thirds ($73,540) of that total awarded to UNB and MTA. For more information on the Medical Research Fund visit http://www.gnb.ca/0391/MedicalResearch-e.asp.

[100] Available for download on the department website: http://www.intrd.gov.nl.ca/intrd/Innovation.htm

Industrial Research and Innovation Fund (IRIF)

The *Industrial Research and Innovation Fund (IRIF)* was developed with the goal of enhancing research and innovation within both the public and private sectors "as a means of fostering long term private sector growth and employment creation in Newfoundland and Labrador." The primary objectives of the IRIF are:

- To take greater advantage of and leverage additional research and development investments from federal research institutions, such as the Canada Foundation for Innovation, to help close the research and innovation gap between Newfoundland and Labrador and the rest of Canada.
- To support research and development investments in targeted high growth "clusters of industrial excellence" that offer significant long term economic development potential.
- To strengthen research excellence, the capacity for innovation and the international competitiveness of the province's higher education and public research institutions.
- To improve the province's ability to develop, attract and retain high quality, world class scientists and researchers.
- To serve as a catalyst in promoting new strategic R&D partnerships and alliances between government, Memorial University [of Newfoundland], other provincial research organizations and the private sector.

Eligible research institutions include Memorial University of Newfoundland (MUN) and the College of the North Atlantic (CONA) with government,[101] industry and other private sector partners not able to apply directly to the Fund but encouraged to be involved as project partners with the above-named eligible institutions.

The IRIF normally provides up to of 40% of the total eligible projects costs with a maximum award of "$300,000 where there is no private sector partner and ...$500,000 where there is a private sector partner(s) and the private sector partner(s) contributes more than 25% of the total eligible costs." As of Spring 2005, 35 projects were supported through the IRIF, totalling over $5 million.

Newfoundland and Labrador Centre for Applied Health Research (NLCAHR)[102]

The *Newfoundland and Labrador Centre for Applied Health Research (NLCAHR)* was established in 1999 as a centre "to promote interdisciplinary research on applied health issues and to facilitate evidence-based decision making in the province's healthcare system." Through funding provided by the province's Department of Health and Community Services, Memorial University of Newfoundland and the Health Care Corporation of St. John's, the NLCAHR "supports applied health research and training in the province, both directly through the allocation of grants and fellowships and indirectly by attracting funding from external granting agencies."

The specific objectives of the NLCAHR are:

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[101] The AIF program is not normally an allowable source of matching funding.

[102] Information cited and available from the Centre's website: www.nlcahr.mun.ca

- To support applied health research that has the potential to improve the health of individuals, families and communities.
- To build and sustain a full range of applied health research including the development and utilization of evidence-based decision making in health care, health education, and health policy and administration in Newfoundland and Labrador.
- To support the training and development of new health researchers in the province.
- To assist researchers in establishing their research programs and applying for external funding.
- To encourage partnerships between researchers across faculties, schools and disciplines, and collaboration among academic researchers, community-based researchers, and decision makers.
- To support applied health research programs through fellowships to graduate students.

In working toward these objectives, the Centre provides funding through several mechanisms guided by the priority themes of: (1) special health challenges of Newfoundland and Labrador, (2) health promotion and wellness and (3) efficiency and effectiveness of the provincial health care system. These mechanisms include research grants, graduate student fellowships, visiting scholars' awards and the newly created scholar-in-residence awards. Since its first awards were disbursed in 2001, the NLCAHR has awarded more than $1.36 million to Newfoundland and Labrador researchers.

Nova Scotia

In October 2000, the Nova Scotia government released a new ten-year strategy to guide the province's economic development. *Opportunities for Prosperity: A New Economic Growth Strategy for Nova Scotians* identifies seven strategic areas in which the province will focus over the long term: business climate, infrastructure, innovation, labour force, investment, exports, and regional capacity.

Evolving out of the province's overall plan, the Nova Scotia government released, in 2003, a new policy for provincial innovation, *Innovation Nova Scotia: An Innovation Policy for the Nova Scotia Economy,*[103] designed to help Nova Scotia in its efforts to become one of the leading innovation regions in Canada. Within this policy, the Nova Scotia government promotes increased commercialization as a key catalyst for economic growth.

Nova Scotia Research and Innovation Trust Fund (NSRITF)

The *Nova Scotia Research and Innovation Trust Fund (NSRITF)* was established in 2001 to help Nova Scotia's research institutions access the matching funding required by the Canada Foundation for Innovation. Disbursements of NSRITF funds are determined by a Beneficiaries Committee, consisting of representatives from the province's universities as well as the Nova Scotia Community College, Genome Atlantic and the Life Sciences Development Association.

Established with an initial investment of $15 million, in winter 2004 the government of Nova Scotia announced an additional $5 million for the Fund. In early 2005, another $8 million was invested followed by $5 million in the 2005–2006 budget. In total, this results in approximately $33 million invested by the government of Nova Scotia to assist the province's researchers and research institutions in accessing federal research funding programs.

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[103] Both the *Opportunities for Prosperity* and *Innovation Nova Scotia* documents are available on the Nova Scotia Economic Development website: www.gov.ns.ca/econ/overview.asp.

Nova Scotia Health Research Foundation (NSHRF)[104]

The province has also invested in health-specific research through the *Nova Scotia Health Research Foundation (NSHRF)*. The mission of the NSHRF is "to help improve the health of Nova Scotians by developing and supporting a vibrant and sustainable health research community throughout the province." NSHRF has programs intended to build health research capacity across Nova Scotia through activities that include, but are not limited to, the following:

- encouraging and facilitating collaboration and cooperation among researchers;
- providing workshop assistance by helping groups interested in planning and hosting conferences and workshops uniting researchers and educators;
- fostering discussion within and producing publications for Nova Scotia's health research community;
- communicating research findings and increasing public awareness of health research issues in Nova Scotia;
- working at the national level to make funding bodies and the broader health research and health care community aware of the research talent that exists;
- working with partners[105] in the public and private sector towards common goals; and
- co-sponsoring a new institute in applied health research, which will give senior graduate students and junior faculty experience in research methods, design and proposal writing.

Through its three key programs (the Research Grants Competition, the Matching Grants Competition and the Capacity Building program), the NSHRF provides Nova Scotia's health research community with access to direct funding for health-related research projects, matching funding to secure federal research awards and support for students engaged in health research. NSHRF funding is received by an annual grant from the Nova Scotia government. The grant for the 2004–2005 fiscal year was $4.5 million.

Prince Edward Island

While Prince Edward Island does not have a provincial innovation strategy in place, the province has committed new R&D investment through its Research and Development Initiative and continued its discipline-specific investments within the health sector. These programs are outlined below.

Research and Development Initiative (RDI)[106]

The *Research and Development Initiative (RDI)*, announced by the province in April 2005, is "designed to build capacity in research and development innovation by supporting the transformation of ideas into products." Through four different funds the RDI will provide universities, businesses and other research institutions with non-repayable funding, up to a maximum of 40%[107] of total eligible costs.[108] The Initiative also encourages collaboration between research institutions, with a specific focus on the post-secondary sector.

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[104] In 2004, Landry and Associates released *Establishing Credibility—Delivering Value* a document reviewing the NSHRF. That document (and consultation with NSHRF staff) was the basis for this summary. The full document can be found at http://www.nshrf.ca/news/reports.shtml.

[105] Partners they have collaborated with in various initiatives include Dalhousie University's Faculty of Medicine, St. Francis Xavier University, IWK Health Centre, Life Sciences Development Association, Atlantic Health Promotion Research Centre, Canada Health Services Research Foundation (CHSRF), and the Canadian Institutes of Health Research (CIHR)

[106] www.techpei.com/photos/original/techpei_rd_back.pdf

Of the four funds available, two are specifically identified as sources of support for academic research (Institutional Research Fund and Human Resources Research Fund); one is a source of funding for businesses or collaborations between businesses and academic institutions (Product Development Fund) and the other does not identify individual sectors (Technical Development Fund). In total, applicants may receive up to $190,000[109] to support their research projects as it is possible to receive funding from more than one program.

Prince Edward Island Health Research Program (PHRP)[110]

As part of its 1999 budget, the province announced the establishment of a $2 million Health Research Fund to "support innovative research and education efforts and where possible to develop partnerships to build further knowledge about these conditions [asthma, cancer, diabetes] and advances in treatment." The purposes of the PHRP are:

- to provide new information regarding health services and systems in Prince Edward Island;
- to conduct research aimed at providing new knowledge regarding Prince Edward Island residents with diabetes, asthma, cancer or other illnesses;
- to provide new knowledge about the prevention, early detection and management of diabetes, asthma, cancer or other illnesses; and
- to assist in determining best practices in the prevention and treatment of diabetes, asthma, cancer or other illnesses.

In meeting these objectives, the program supports public, private and not-for-profit entities whose research is consistent with one or more of the program's purposes, displays evidence of partnership and/or collaboration with other relevant organizations, and meets satisfactory ethics approval. In the end, the program is largely a matching-funds initiative designed to increase the ability of Prince Edward Island researchers to obtain federally awarded funding.

Through its Call for Proposals process, the PHRP has funded a total of 19 health-specific projects since its inception. As of fall 2004, it continued to allocate funds from the original $2 million dollar Health Research Fund invested in 1999 and will continue to release its regular call for proposals in the spring and fall of each year until all funding has been disbursed (as no additional funds had yet been committed).

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[107] Each fund has a designated cut-off amount.

[108] Including but not limited to: capital assistance, applied research to assess or strengthen the technical or scientific aspects of a concept, intellectual property protection initiatives, concept validation/proof of principle, prototype development, bench tests, pilot projects, clinical trials/pre-clinical trials, studies and other pre-commercial activities, commercial development and skills development.

[109] Maximum contributions: Institutional Research Fund=$50,000; Human Resources Research Fund=$40,000; Product Development Fund=$75,000 and Technical Development Fund=$25,000.

[110] www.gov.pe.ca/infopei/onelisting.php3/number=39371

Prince Edward Island Health Research Institute (PEIHRI)[111]

In an effort to increase the Island's share of nationally peer-reviewed funding for universities, in May 2000, the province announced the establishment of the Prince Edward Island Health Research Institute (PEIHRI). In collaboration with the University of Prince Edward Island (UPEI) and the Atlantic Canada Opportunities Agency (ACOA), the provincial government committed to developing this institute "to support, promote and enhance quality research related to human health on PEI, thereby contributing to the health of Islanders and Canadians and to the economy of Prince Edward Island."

Although it does not provide money directly to research projects, the PEIHRI provides funding to enhance the project, at the proposal stage, through: the Individual/Group Grant Submission Bridge Program, Grant Development Support Awards, and Research Group Development Awards. The PEIHRI also provides assistance within an advisory and/or knowledge-sharing capacity through its Pre-Submission Review of Grant Applications, Health Research Forum and Seminar Series. Finally, the PEIHRI assists the academic community through administration of the University of Prince Edward Island-Canada Institutes of Health Research Regional Partnership Program (UPEI-CIHR RPP).

Despite the abundance of activity outlined in this section, the most recent national level data (as described in the following section) show that while Atlantic provincial governments have increased their university R&D investments in recent years, other provinces have invested more.

5.3 Provincial Government Funding—Atlantic Canada in the National Context

According to data reported by the Canadian Association of University Business Officers (CAUBO) in 2002-2003, Canada's universities received more than $800 million from provincial governments to support sponsored research[112]—a 176% increase from provincial government funding just a few years earlier. As Figure 5.1 illustrates, this level of growth was evident in three of Canada's four geographic regions with Atlantic Canada's growth level quite different from the rest of the country. Although Newfoundland and Labrador experienced the highest growth rate in Canada (302%; just higher than BC at 299%) between 1997-1998 and 2002-2003, each of the Maritime provinces reported much lower growth (PE=26%; NS =56%; NB=20%), which considerably impacted the regional total.

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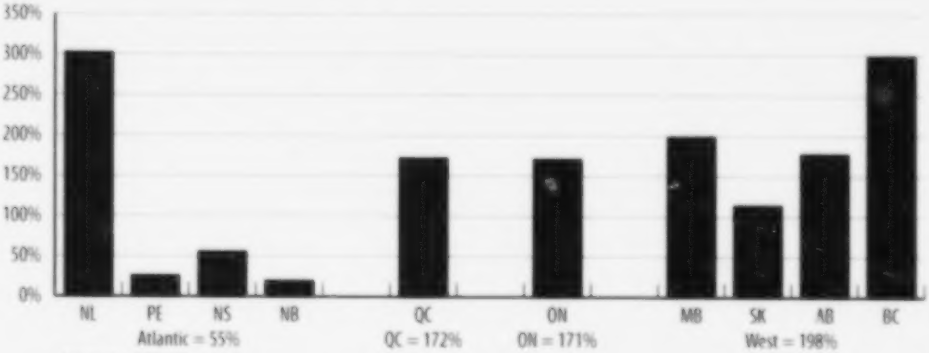
[111] www.upei.ca/peihri/mission.html

[112] It should be noted that research income can be awarded by provincial governments but not shown in these data. More specifically, some general operating budgets include designated amounts for research; these amounts would be reported as general operating income and not as sponsored research income.

Figure 5.1
Growth in Sponsored Research Revenues Received from Provincial Governments by Province, 1997–1998 to 2002–2003

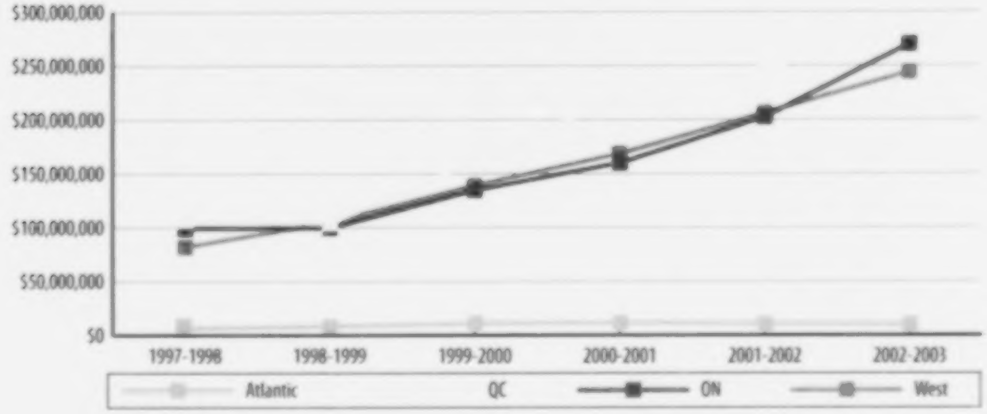


* Constant dollars.
Source: CAUBO, Report 2.1A; author's calculations.

Figures 5.2 and 5.3 provide a broader picture of provincial government funding by presenting income received by universities on a regional basis, and then for each Atlantic province, between 1997–1998 and 2002–2003. In Figure 5.2, it is clear that for Atlantic Canada as a whole, increases in sponsored research income were considerably lower than for the remaining regions (ranging from between $80 and $106 million in 1997–1998 to $244 and $290 million in 2002–2003). Furthermore, provincial government funding of sponsored research in Atlantic Canada still fell well below national and regional averages and by 2002–2003 had not even met the 1997–1998 funding amounts evident in other regions.

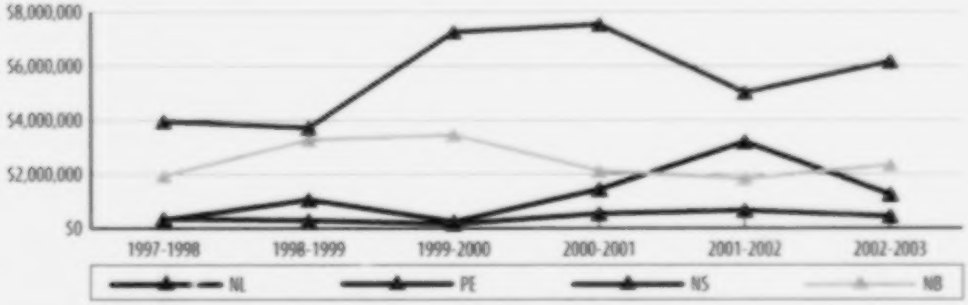
Figure 5.3 shows that for each Atlantic province, provincial government funding of sponsored research fluctuated considerably. Each province reported increases and decreases throughout the time period with Newfoundland and Labrador showing momentum until 2001–2002, then decreasing in the following year (2002–2003) to less than half the amount reported just one year earlier. In Prince Edward Island, sponsored research income remained below the $1 million dollar mark, reaching its highest level in 2001–2002 (close to $700,000) and its lowest in 1999–2000 (under $200,000). Nova Scotia received the highest amount of provincial government income soaring (in relation to its Atlantic counterparts) to more than $7 million in 1999–2000 and 2000–2001, decreasing in the following year to $5 million, and then increasing again to just over $6 million in 2002–2003. New Brunswick universities, which had reached Nova Scotia's funding levels by 1998–1999, did not continue to receive increased provincial government funding and as a result fell behind university investment reported in Nova Scotia by the following year. In 2001–2002, New Brunswick universities reported their lowest levels of sponsored research income received from the province during this period (just under $2 million), but rebounded slightly in the following year (over $2 million).

Figure 5.2
Distribution of Provincial Government Funding of University Sponsored Research by Region, 1997–1998 to 2002–2003



* Constant dollars.
Source: CAUBO Report 2.1A; author's calculations.

Figure 5.3
Distribution of Provincial Government Funding of Atlantic University Sponsored Research by Province, 1997–1998 to 2002–2003



* Constant dollars.
Source: CAUBO Report 2.1A; author's calculations.

Provincial Government Funding per Capita

On a per capita basis (as shown in Figure 5.4 on the opposite page), in 2002–2003 (the latest data available) universities in Atlantic Canada received at least six times less in sponsored research income from the provincial government than universities in other regions across Canada.

When considered at the provincial level, the Atlantic provinces remain well behind their national counterparts with per capita income ranging from $2 to $7 in Atlantic Canada and $15 to $38 in the rest of the country. Within the Atlantic provinces, Nova Scotia reported the highest per capita income ($7) followed by Prince Edward Island and New Brunswick ($3 each). In this case, Newfoundland and Labrador was the least funded Atlantic (and Canadian) province at $2 per capita.[113]

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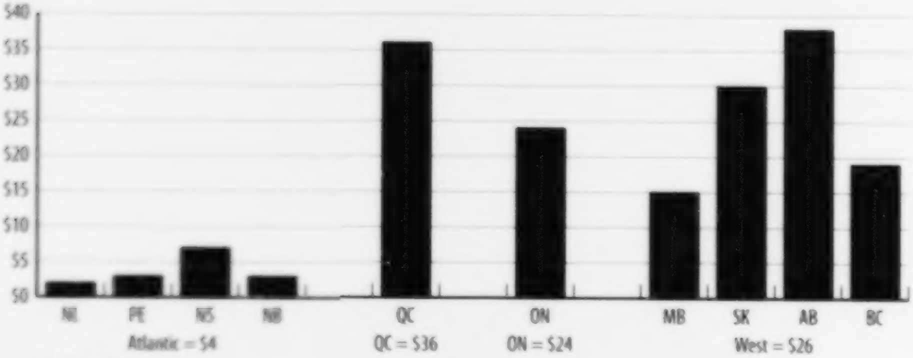
[113] This distribution varied considerably just one year earlier—see Figure 5.6.

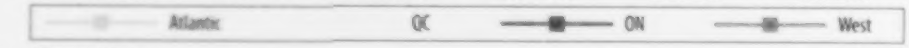
Figure 5.4
Provincial Government Funding of University Sponsored Research, Per Capita by Province, 2002-2003



* Constant dollars.
Source: CAUBO, Report 2.1A; author's calculations.

Although Atlantic Canada has historically been well behind other regions in provincial government funding per capita, it is interesting to note (Figure 5.5) that in recent years the difference between Atlantic Canada and other regions of the country has actually grown. This is due to a sharper increase in provincial government income reported elsewhere in the country than in this region. Whereas Atlantic Canada's per capita income was approximately one third that of the next lowest region in 1997-1998 (Atlantic = $3; West = $9), by 2002-2003, this same measure was six times lower in Atlantic Canada as per capita levels in this region had only slightly increased (Atlantic = $4; Ontario = $24).

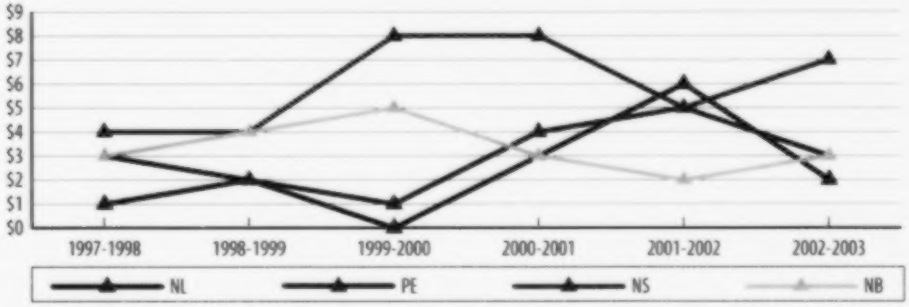
Figure 5.5
Provincial Government Funding of University Sponsored Research, Per Capita by Region, 1997-1998 to 2002-2003



* Constant dollars.
Source: CAUBO Report 2.1A; author's calculations.

Despite the apparent stand-still in income from Atlantic provincial governments, Figure 5.6 shows that, on a per capita basis, Atlantic Canada's universities also experienced fluctuations in funding between 1997-1998 and 2002-2003; however, per capita income was more stable over time than dollars alone. Once again, Nova Scotia had the highest levels of provincial government investment peaking at $8 per capita in 2000-2001 then decreasing to just under $7 in 2002-2003. While Newfoundland and Labrador and New Brunswick met or surpassed Nova Scotia's per capita income at two points in time (NL=2001-2002; NB=1998-1999), they did not maintain these funding levels and returned to a lower level of per capita income by 2002–2003. Growth in Newfoundland and Labrador was particularly volatile, beginning with less then $1 per capita in 1997–1998, reaching a high of just over $6 per capita in 2001–2002, then decreasing to just over $2 per capita in 2002–2003. For the Maritime provinces, changes were less pronounced, although apparent, with considerable increases tempered by impending decreases in each province.

Figure 5.6
Provincial Government Funding of Atlantic University Sponsored Research, Per Capita by Province, 1997–1998 to 2002–2003

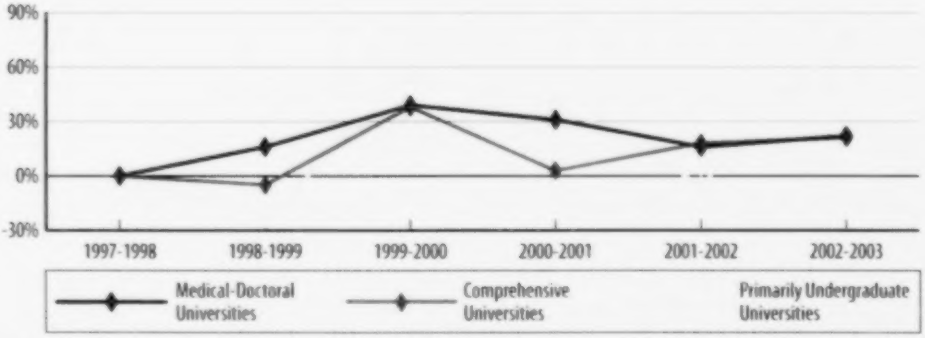


* Constant dollars.
Source: CAUBO Report 2.1A; author's calculations.

Provincial Government Funding by University Type

Analysis of sponsored research income from provincial governments confirms that for all university types, income levels increased between 1997–1998 and 2002–2003 (Figure 5.7). For medical-doctoral universities, income from provincial governments grew more than three times its 1997–1998 level ($206 million) reaching almost $620 million by 2002–2003. For primarily undergraduate universities, income growth was also quite high with a 185% increase between 1997–1998 and 2002–2003 (from just under $10 million in 1997–1998 to almost $28 million in 2002–2003). Comprehensive universities, which had the lowest level of growth by university type (93%), still experienced a near doubling of provincial government income during this same period ($59 million in 1997–1998 to nearly $115 million in 2002–2003).

Figure 5.7
Distribution of Provincial Government Funding for University Sponsored Research by University Type, 1997–1998 to 2002–2003

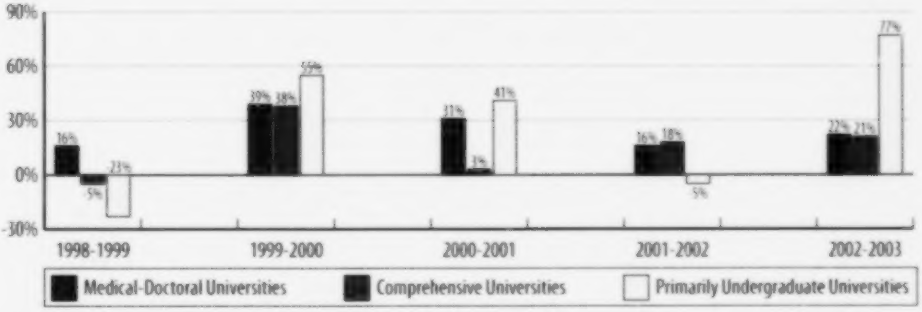


* Constant dollars.
Source: CAUBO Report 3.1; author's calculations.

Figure 5.7 also shows that medical-doctoral universities received, by far, the largest amount of sponsored research income from provincial governments, accounting for the lion's share during all six years. These universities also reported the highest average income levels from approximately $14 million in 1997–1998 to more than $41 million in 2002–2003. Average income in comprehensive universities varied from $5 million to $10 million over the reference period while primarily undergraduate universities averaged approximately $400,000 in 1997–1998 and $1 million in 2002–2003.

Although income from provincial governments increased for all university types between 1997–1998 and 2002–2003, these increases did not occur uniformly. In fact, medical-doctoral universities were the only universities to report increases (growth>0%) for each year in question. As evident in Figure 5.8, primarily undergraduate universities experienced the greatest degree of fluctuation in provincial government income from year to year, ranging from a 23% decrease between 1997–1998 and 1998–1999 to a 55% increase the following year and a 77% increase between 2001–2002 and 2002–2003. Comprehensive universities also experienced a considerable degree of fluctuation in funding with a 5% decrease between 1997–1998 and 1998–1999 followed by increases ranging from 3% to 38% in the following years. As noted earlier, income received by medical-doctoral universities did not decrease between 1997–1998 and 2002–2003; however, growth rates varied from a high of 39% to a low of 16%, on a year-to-year basis.

Figure 5.8
Annual Growth in Sponsored Research Income Received from Provincial Governments by University Type, 1997–1998 to 2002–2003



In summary, sponsored research income received by universities from provincial government grants and contracts was not stable over time. While medical-doctoral universities enjoyed a more secure position in that income from provincial governments had not decreased since 1997–1998, the amount of growth from one year to the next was not predictable. Income for primarily undergraduate universities was the most volatile and was likely a partial contributor to the provincial disparities shown in the previous section. The priority for provincial governments appears to have been to fund sponsored research in medical-doctoral universities with less stable investment provided for other university types.

5.4 Region-Specific Funding: The Atlantic Canada Opportunities Agency (ACOA)

The work of regional economic development agencies has been one of the primary mechanisms (in addition to changes made to national programs as discussed in the previous chapters) whereby the federal government sought to address differences in economic structures, capacity, and impact across the country. In total, there are four such federally-operated agencies: (1) Federal Economic Development

Initiative of Northern Ontario (FedNor),[114] (2)Western Economic Diversification Canada, (3) Canada Economic Development for Québec Regions and (4) Atlantic Canada Opportunities Agency (ACOA). Through these agencies, the federal government is able to spur economic development in a targeted manner but, as shown in the following section, this focussing of resources is largely business-oriented and although related to the mechanisms designed to increase innovation as a whole, is not clearly suited to meet the needs of university-centred innovation in its current format.

Regional Economic Development

Federal Economic Development Initiative for Northern Ontario (FedNor)[115]

As its name signifies, the *Federal Economic Development Initiative for Northern Ontario (FedNor)* is a program created by the federal government to address the economic development needs of northern Ontario. Launched in 1987, FedNor "typically does not provide financing for private businesses;" however, it does administer the Community Futures Program—a staple of each of the regional development agencies[116]—and works "to promote economic growth, diversification, job creation and sustainable, self-reliant communities in northern and rural Ontario, by working with community partners and other organizations to improve small business access to capital, information and markets."

In working under this mission, FedNor contributes to Canada's innovation capacity by helping northern and rural regions of Ontario to "bring new products and services to market as quickly as possible." In doing this, FedNor provides financial support to small businesses,[117] educational institutions, municipalities and others, through four innovation funds: (1) applied research and development, (2) innovation capacity building—capital projects, (3) innovation capacity building—non-capital projects, and (4) general innovation related projects. For each of these funds, eligible projects can receive up to 50% of eligible project costs to a maximum of $500,000.

Western Economic Diversification Canada[118]

Established by the Government of Canada in 1987, *Western Economic Diversification Canada* promotes "the development and diversification of the economy of Western Canada and advances the interests of the West in national economic policy." Its mission is to "support the development and growth of a western Canadian economy that is inclusive, innovative, sustainable and diversified" and it does this through programs and services under three main directions: innovation, entrepreneurship and sustainable communities.

Although Western Economic Diversification Canada asserts that it uses innovative partnerships in all of its activities, their involvement in innovation is articulated as a strategic direction within the department. In this capacity, Western Economic Diversification Canada factors in as a catalyst for innovation by promoting innovation and providing financial investment and partnership building opportunities to "accelerate the rate of technology transfer and commercialization, and increase cooperation between universities and industry."

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[114] The Federal Economic Development Initiative for Northern Ontario (FedNor) is involved in regional development, however, according to the 2005 Budget Plan (Chapter 4) it is considered separately from Canada's regional development agencies "$800 million…through the regional development agencies and the Federal Economic Development Initiative for Northern Ontario (FedNor)" (www.fin.gc.ca/budget05/bp/bpc4ce.htm). For simplicity, and given its mandate, it is included here as a regional development agency.

[115] www.strategis.ic.gc.ca/epic/internet/infednor-fednor.nsf

[116] Information on this program can be found on each website.

[117] Businesses within the boundaries of FedNor that have fewer than 250 employees and less than $20 million in annual sales.

[118] www.wd.gc.ca

Since its inception, the department has invested approximately $2.7 billion in Western Canada, of which most was directed to innovation. "In 2002–2003 alone, [Western Economic Development Canada] invested $54.9 million, or 60 per cent of all new approved projects, to support innovation in the West, leveraging a total of $155 million. In other words, for every dollar [the department] invested, another $1.82 was leveraged." These funds were disbursed through several projects and sectors, including: Western Economic Partnership Agreements (WEPAs), environmental technologies, fuel cells, Canadian light source, and other initiatives and innovation related projects.

Canada Economic Development for Québec Regions[119]

In Québec, the Canada Economic Development for Québec Regions acts as a catalyst for economic development "paying special attention to those [regions] experiencing slow economic growth and inadequate employment, with a view to the enhancement of prosperity and employment in the long term." In working under this mandate, the Agency supports small and medium size enterprises (SMEs), non-profit organizations providing services to SMEs, and communities, by offering services in: enterprise incubation, prestartup and startup, business intelligence, consulting and networking, assistance for innovation, R&D and productivity and commercialization and exports. Departmental priorities are: (1) innovation and knowledge economy and (2) regions experiencing adjustment difficulties while strategic outcomes targeted are to increase enterprises' competitiveness and the vitality of communities.

It is by analysing the situation in each region with respect to specific dynamics in innovation that the Agency adapts its intervention by means of its regional intervention strategies. It provides SMEs with advice and guidance, information and referrals as well as financial assistance for pursuing innovation-related projects. As to regions experiencing adjustment difficulties, Canada Economic Development varies its intervention from one region in difficulty to another, depending on their development challenges and potential.

Financial assistance comes mainly from the Agency's three regular programs: (1) Innovation, development, entrepreneurship and access program for SMEs (IDEA-SMEs), (2) Regional Strategic Initiative (RSI) and (3) Community Futures Program (CFP). For the 2005–2006 fiscal year, Canada Economic Development will have at its disposal $509 million in financial resources for the promotion of economic development of the regions of Québec. Of that total, approximately $112 million is spending planned for the priority of innovation and knowledge economy.

Atlantic Canada Opportunities Agency (ACOA)[120]

In Atlantic Canada, regional economic development falls in the hands of the *Atlantic Canada Opportunities Agency (ACOA)*. With a broad mandate to "enhance the growth of earned income and employment opportunities" in Atlantic Canada, ACOA delivers an extensive range of services[121] to its clientele. These services fall under one of three strategic outcomes: (1) enterprise development, (2) community development and (3) policy, advocacy and co-ordination. Innovation is described, within the Agency's Program Activity Architecture (PAA), within the enterprise development outcome.

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[119] www.dec-ced.gc.ca and *Report on Plans and Priorities, 2005-2006.*

[120] www.acoa-apeca.gc.ca

[121] These are outlined in *Building a 21st Century Economy, Together: A Guide to the Programs and Services of the Atlantic Canada Opportunities Agency* which can be downloaded at: www.acoa.ca/e/about/building/index.shtml.

As noted in its 2005–2006 *Report on Plans and Priorities*, for ACOA, the sub-activity of innovation (one of several actions described under enterprise development) is developed with the intent to "increase activity in and build capacity for innovation, research and development (R&D) of technologies, products, processes or services, technology adoption/adaptation and commercialization of R&D outputs that contribute to economic growth in Atlantic Canada." To meet these objectives, the Agency uses three main programs: the Business Development Program (BDP), the Innovation Skills Development Initiative (ISDI) and the Atlantic Innovation Fund (AIF), each of which contribute leveraging funds, encourage collaboration and foster commercialization within Atlantic Canada. For the 2005–2006 fiscal year, ACOA plans to spend more than $128 million on innovation activity.

The Atlantic Innovation Fund (AIF), the key program with respect to Atlantic Canada's universities (and seemingly the only program of its kind in Canada), is addressed in detail in the following section.

The Atlantic Innovation Fund (AIF)

The Atlantic Innovation Fund (AIF) is a $300 million five-year investment[122] into the region's economic growth. Through it, the federal government provides funding to strengthen and accelerate Atlantic Canada's development of knowledge-based industry. The focus, criteria and funding provided via this program are outlined below.

Investments made through the AIF are intended to focus on, but not be restricted to, emerging sectors in Atlantic Canada deemed to possess good global growth prospects[123] and to encourage additional sectors with the development of technology that will improve their competitive positions.

AIF funding is available to both commercial and non-commercial entities in the region, provided they meet the following essential criteria:

- compatible with the AIF objectives;
- scientifically and/or technically sound;
- demonstrate management capability to successfully undertake the project;
- demonstrate significant economic benefits for Atlantic Canada;
- address ultimate commercialization potential of the project;
- support new or improved technologies or new applications of technologies;
- have adequate financing for the duration of the project;
- be incremental; and
- support one or more strategic sectors/technologies

In addition to these essential criteria, the AIF favours projects with a combination of desirable criteria[124] such as the inclusion of private sector involvement for institutional proposals, and those that reach beyond a single locale or province.

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[122] In the 2005 Federal Budget, the government renewed this investment of $300 million.

[123] These include: aquaculture, environmental technologies, information technologies (e.g., communications, geomatics), health and medical technologies, ocean technologies, and biotechnology.

[124] These include: private sector participation (for institutional proposals); fills a gap in the Atlantic system of innovation; improves innovation capacity of private sector; is pan-Atlantic in scope; builds critical mass through networks/cooperation of existing and/or additional talent (researchers); leverages funding from other public and private sector sources; attracts new firms, institutions and researchers to Atlantic Canada; builds on research excellence; and fosters national and international affiliations.

For the initial $300 million investment, contributions were provided based on responses to the AIF's Request for Proposals (RFP) (which occurred in two stages: Round 1 and Round 2) and were negotiated to be the least amount required to allow a project to proceed. The maximum allowable contribution for non-commercial organizations was 80%, while the maximum allowable for commercial organizations was 75% of total eligible costs.[125]

Distribution of AIF Funding

Since its inception, AIF has provided funding for 102 Atlantic-based research projects (47 in Round 1; 55 in Round 2). In Round 1, 17 of these projects were led by a commercial organization and 30 by a non-commercial organization. In Round 2, seven additional commercial organizations were awarded funding (24) while 30 non-commercial organizations were again funded (the Pan-Atlantic award for the development of an Atlantic research commercialization network, launched in 2005 as Springboard Atlantic, is not grouped in either category).

To enhance the likelihood of commercialization success, increase communication and collaboration between stakeholders in the Atlantic system of innovation, and improve innovation capacity of the private sector, ACOA encouraged those applying to the AIF to actively seek out opportunities for collaboration to help maximize the economic benefits of AIF resources. These collaborations could be in the areas of research and development, project management, marketing or commercialization expertise and so on. As a result, the number of organizations significantly participating in AIF funded projects is considerably larger than the 69 proponents of the 102 projects selected (278).[126]

Non-commercial organizations collaborated with a variety of sources within teaching institutions, the private sector and the federal and provincial governments, with private sector collaborations making up the largest percentage (90/202 or 44%).[127] Commercial organizations also collaborated with several sources, although to a much lesser extent. Most of these collaborations were with other private sector organizations (35/76 or 46%) or with teaching institutions (29/76 or 38%). Within these institution-based "partnerships," Atlantic Canada's publicly-funded universities were the majority, accounting for 69% (20) of the 29 identified institutional collaborations.[128]

What is also interesting to note is that while most of the 278 significant partners were from the same province (116/278 or 42%) or another Atlantic province (79/278 or 28%) as the lead proponent, 30% (83/278) were from outside the region—a noteworthy relationship given the Fund's regional base. The fact that one third of the collaborations were from outside Atlantic Canada speaks to the network-building capacity of the projects and of the AIF program.

Table 5.1 shows the distribution of dollars awarded through the AIF by province, and commercial or non-commercial classification.[129] In Round 1, over 70% ($110 million) of all AIF dollars ($155 million) were awarded to non-commercial organizations. In Round 2, the percentage was more evenly disbursed with non-commercial organizations receiving just over half ($74 million) of all dollars awarded ($136 million; $139 million if including the pan-Atlantic project).

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[125] A complete description is found on the ACOA website: www.acoa.ca/e/financial/aif/over.shtml.

[126] This number was derived by ACOA and does not include other "less significant" or informal collaborations.

[127] Non-commercial organizations are examined in further detail later in the chapter.

[128] Other teaching institutions include community colleges and research hospitals.

[129] According to classifications of the project lead. As described later in the chapter, collaborating partners can also receive funding but amounts are not reflected for each individual "partner."

Table 5.1
Distribution of AIF Funding by Province, Round and Commercial or Non-Commercial Classification ($000)

	Round 1	Round 2	Total
Non-Commercial			
NL	36,725	26,000	62,725
PE	19,500	8,200	27,700
NS	29,750	22,600	52,350
NB	24,400	17,000	41,400
Total	**110,375**	**73,800**	**184,175**
Commercial			
NL	8,300	12,900	21,200
PE	6,000	8,600	14,600
NS	16,850	25,000	41,850
NB	13,200	15,400	28,600
Total	**44,350**	**61,900**	**106,250**
Combined			
NL	45,025	38,900	83,925
PE	25,500	16,800	42,300
NS	46,600	47,600	94,200
NB	37,600	32,400	70,000
Total	**154,725**	**135,700**	**290,425**
Pan-Atlantic*		3,600	
Total	**154,725**	**139,300**	**294,025**

* Pan-Atlantic, in this sense, refers to the Association of Atlantic Universities (AAU)—Establisment of an Atlantic Research Commercialization Network (Springboard Atlantic).
Source: ACOA.

Among the provinces, Nova Scotia received the highest level of funding within the commercial sector ($42 million) and the combined total ($94 million); however, the province was second to Newfoundland and Labrador ($63 million) in funding of non-commercial organizations (which is somewhat surprising given that the province is home to 10 of the 17 public universities in the Atlantic provinces—this is explored further in Figure 5.10).

Table 5.1 also shows that within each round of the program, all provinces received financial support in both commercial and non-commercial endeavours. In Round 1, non-commercial organizations received more funding in each of the provinces than did commercial organizations; however, in Round 2, they received considerably more money only in Newfoundland and Labrador.

Nova Scotia and Newfoundland and Labrador were the largest benefactors, by province, for both project types.

Collaborations within University-led Projects

As stated earlier, 60 projects led by non-commercial organizations were awarded funding through the AIF. However, organizations were encouraged to collaborate with others in an effort to maximize AIF's research investment. This resulted in these projects having significant collaborations with 202 other non-commercial and commercial entities.

For the 12 public universities (considered to be the lead and cited on the website) funded through the AIF, these collaborations occurred with other teaching institutions, the private sector, and federal and provincial governments. Collaborations within university-based projects accounted for 61% (123/202) of total "partnerships" with non-commercial organizations as the lead.

For Atlantic universities, the most common collaborations occurred with the private sector (55/123 or 45%) followed by other teaching institutions (43/123 or 35%). The remaining 25 collaborations were spread across government and other sources.[130]

In Appendix C four of the region's top collaborations, with Atlantic universities as the lead proponent, are briefly described.[131] These include the Centre for Marine Compressed Natural Gas (NL), the Atlantic Canada Network for Bioactive Compounds (PE), Materials Technology Network (NS), and Novel Bioreactor for Wastewater Treatment (NB). Through these four projects, and others like them, the Atlantic provinces are benefiting from AIF investment. The following section takes a closer look at AIF investment when led by one of Atlantic Canada's 17 universities.

Distribution of AIF Funding to Universities

Table 5.2 shows the distribution of AIF funding to Atlantic Canada's public universities (17 in total; 12 received AIF funding in at least one round). It demonstrates the amount of funding given to each university as the lead proponent of an AIF project. It does not, however, show the total amount of funding received by each university through the AIF as a whole for, as noted earlier, universities may be involved in AIF projects as collaborators and in this context would not be included in this list. Once AIF funding has been disbursed, data from the Canadian Association of University Business Officers (CAUBO—*Financial Information of Universities and Colleges*, Table 6) will allow for a broader understanding of AIF support as funding amounts over $100,000[132] will be identified for universities that received funding in any capacity—not just as the project lead.

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[130] When a non-commercial organization other than those identified to be a publicly-funded university was the lead proponent, institutions were involved in 16/79 (20%) cases; however, a breakdown by university was not available.

[131] Upon request, the Atlantic Canada Opportunities Agency chose these projects for inclusion in this report as examples of successful collaboration between at least one Atlantic university within each province and its project partners.

[132] Under $100,000 would not be identified as AIF but instead reported as "other federal."

Table 5.2
Distribution of AIF Funding Received by University and Round

	Round 1	Round 2	Total
NL			
MUN	21,600	21,600	43,200
NL Total	**21,600**	**21,600**	**43,200**
PE			
UPEI	6,000	8,200	14,200
PE Total	**6,000**	**8,200**	**14,200**
NS			
Acad	0	1,500	1,500
CBU	0	5,600	5,600
Dal	10,450	2,100	12,550
MSVU	0	2,100	2,100
NSAC	0	1,900	1,900
SFXU	3,000	6,500	9,500
SMU	0	2,500	2,500
NS Total	**13,450**	**22,200**	**35,650**
NB			
MTA	400	0	400
UdeM	5,000	5,500	10,500
UNB	9,700	7,500	17,200
NB Total	**15,100**	**13,000**	**28,100**
Atlantic Total	**56,150**	**65,000**	**121,150**

Source: ACOA.

Between Rounds 1 and 2 there was a considerable change in the distribution of AIF dollars. In Round 1, seven universities received funding as the lead proponent; in Round 2, 11 received an award. However, the real difference lies in funding to Nova Scotia universities, where, in Round 1 only Dalhousie University (Dal) and St. Francis Xavier University (SFXU) received money from the AIF; by Round 2, five other Nova Scotia universities joined this list. Furthermore, in Round 1 Dalhousie University received a substantial portion ($10.5 million or 19%) of all AIF dollars; but in the second round, Nova Scotia funding was much more disbursed, with the largest award going to St. Francis Xavier University ($6.5 million).

Memorial University of Newfoundland (MUN) received the highest amount of AIF funding with $21.6 million in each round more than twice the total funding of the second highest recipient, the University of New Brunswick ($17 million).

Notably, concern can be heard within the university community over the application process and the bureaucratic red tape that embroils the AIF process. The problem appears to lie in the administrative approach to the distribution of funds with universities being forced to bear the burden in attracting private sector involvement. Although from numbers shown above, one can see that substantial inroads have been made in generating collaborative research, one can also see that many more partnerships have been made when non-commercial organizations (of which the majority are universities) are the project lead. Further, many academic researchers have vented frustration with the ACOA approach to the AIF noting that the business model does not easily transfer to the academic model of doing research. Much work still needs to be done to bring the parties together and to effectively reach the Fund's goals of enhancing research to build Atlantic Canada's economic capacity.

Springboard Atlantic, the Atlantic region's research commercialization network,[133] is believed to be a step in this direction as it is designed to facilitate collaboration between the university and business sectors. This network is directed by the Association of Atlantic Universities (AAU) and through an initial AIF investment of $3.6 million over three years, it was developed to "encourage the effective and efficient transfer of technology among universities in Atlantic Canada and to advance the commercialization of research within both universities and the region's private sector."[134]

Equally as important with respect to AIF funding is the need for Atlantic researchers to go through parallel application processes in order to receive matching funding for federally-based programs (such as the CFI). There are a number of issues with this parallel process. The first is that the focus of the AIF might not, in any number of cases, coincide with proposals put forward for federal funding and as a result, a research project approved at the federal level could theoretically not be approved at the regional level. This would force researchers to spend additional resources in pursuit of matching funds that, as examined throughout the report, are severely limited in this region. Second, and in relation to the first point, Atlantic Canadian researchers have a much harder time attracting industry investment, largely because of the nature of Atlantic Canadian industry, than is the case elsewhere in the country. Finally, as reflected in MPHEC consultations with senior research administrators, and alluded to above, there are concerns about the difficulty in aligning differing industry and academic perspectives on R&D and innovation. These issues warrant further exploration.

Region-Specific Funding in Atlantic Canada

The desire to spread the benefits of the federal government's re-investment in R&D from one end of the country to the other continues to be heard in government speeches and budgetary provisions. In the 2004 Budget for example, the federal government announced a continuing commitment to regional and sectoral development which "will target the fundamentals—skills upgrading, support for research and development, community development, and modern infrastructure such as broad band communication—by employing the regional agencies and tools such as the Atlantic Innovation Fund." In the 2005 Budget, this sentiment was echoed as the federal government committed to a full renewal in funding ($300 million) of the Atlantic Innovation Fund.[135]

There is no doubt that the presence of the Atlantic Canada Opportunities Agency, and its Atlantic Innovation Fund in particular, have led to major achievements in developing a much stronger and more collaborative innovation base in Atlantic Canada. There are however a number of major issues that need to be addressed if Atlantic Canada is to move forward at the same innovative pace as the rest of the country.

First, there are questions about adequacy of funding. Is the amount provided to regional development sufficient? A recent report by APEC seems to suggest that the answer to this question is no, at least with respect to business investment. The APEC (2004) report states that "contrary to public perceptions, total subsidies to business in Atlantic Canada, as measured on a per capita basis, are well below the Canadian average. Numerous changes in program scope and design have parallelled the decline in federal funding for regional development in Atlantic Canada. Initially, federal programs focussed on the four Atlantic provinces and eastern Québec, although this focus was quickly lost as the program scope extended across the country [through a broader regional networking and funding system]...However effective this might be in delivering government services across the country, it represents a substantial diminution of earlier efforts to reduce disparities in earned income and employment." In the 2005 Budget announcement, there is a re-investment into Canada's regional development initiatives with a considerable proportion of that funding directed toward ACOA. This reinvestment suggests that questions about overall funding levels are at least being considered.

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[133] In Table 5.1 this project is referred to as the pan-Atlantic project.

[134] Additional information is available for download at: www.springboardatlantic.ca

[135] Further details are available at: http://www.fin.gc.ca/budget05/bp/bpc4ce.htm#region.

Second, regardless of any debate about relative adequacy of overall funding levels, potential demand for innovation support clearly outstrips the agency's capacity across all sectors. This has led the agency to focus its AIF funding according to specific areas reflecting its economic mandate, its need to be strategic, and its commercialization priorities (e.g. achieving demonstrable economic results). The benefits provided by this fund should not be underestimated or undervalued particularly now that Springboard Atlantic is poised to assist researchers and institutions with some of the relatively heavy administrative burden involved in networking universities and small firms toward commercialization. In the final analysis, however, the AIF program is not well-suited to fully meet the region's wide-range of university funding needs.

Chapter 6—*Conclusions and Implications*

6.1 What is Innovation?

Since the August 2000 release of the Commission's *Report on Post-Secondary Research Trends in Atlantic Canada*, the federal government has invested billions of dollars into R&D initiatives. As recently as the 2005 Budget, the government of Canada committed increased funding to research-related initiatives such as the granting councils, the Indirect Costs program and the Atlantic Innovation Fund.[136] These investments represent the federal government's commitment to making Canada one of the leading innovative nations in the world as set out in the 2001 Speech from the Throne and the 2002 Innovation Strategy documents, *Achieving Excellence: Investing in People, Knowledge and Opportunity* and *Knowledge Matters: Skills and Learning for Canadians*. However, as has been suggested throughout the report, the use of commercialization of R&D as the essential definition of innovation fails to recognize some of the key contributions this region (and others) make to the enhancement of Canada's innovation capacity.

According to the Collins English Dictionary to innovate is "to invent or begin to apply (methods, ideas, etc.)" while innovation is "something newly introduced, such as a new method or device." If one uses these definitions, to innovate and engage in innovation is not only to invent or apply methods and products but also to invent, develop and apply *ideas*. As such, innovation includes not only the process of developing products but "beginning to apply" or "newly introducing" *people* who will develop and use innovative products; therefore, enhancing a country's (region's or institution's) innovation capacity requires the education of people who can put knowledge into practice. This approach is not new. The federal government recognized this need in both its Strategy documents; however, funding to support people in the innovation process is almost entirely directed toward the mid to latter stages of innovation (assist top and promising researchers, support research infrastructure needs, foster partnerships between various sectors) with little to no direct support allocated to increasing and enhancing early research experiences and the training of innovators of tomorrow.

In order to capitalize on the country's strengths, and to account for its limitations, it is important that the definition of innovation, and the initiatives undertaken to support a culture of innovation, be expanded so that not only is the commercialization of R&D supported (for it is not the intention of this paper to minimize the substantial importance of this endeavour), but also the early stages of R&D are recognized and financially supported.

In recent years, new approaches to the advancement of Canada's R&D community have been implemented, with these initiatives having a significant impact on how we see universities and university research. From an Atlantic perspective, progress has been made in recognizing that universities across the country are not homogenous and that it is essential to consider this diversity in the process of federal program design. However, further work is required by all parties to take full advantage of the potential R&D capacity in Atlantic Canada.

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[136] See: http://www.fin.gc.ca/budtoce/2005/budliste.htm

6.2 The Evolution of National and Atlantic R&D

Atlantic Canada is contributing to the national R&D community and the resulting innovation capacity of the country. Universities in the region have collaborated on research projects in many disciplines, with different partners of both large and small scale capacity. They have also been able to attract some of the best and the brightest researchers in their field, and have accessed infrastructure funding that was not available just a few years ago. While business sector involvement continues to be limited in Atlantic Canada, contributions from the region's higher education sector continue to expand, with R&D funding (per capita) slightly higher than at the national level. The Atlantic region has maintained its national funding proportions with respect to the granting councils and even slightly increased both NSERC and SSHRC proportions of funding. Provincial governments have also become more involved in university R&D (and R&D more generally) through the development of funding mechanisms designed to enhance the region's R&D capacity and ability to access newly-created, as well as long-standing, research funding mechanisms. The federal government, too, has directly invested in Atlantic research through development of the Atlantic Innovation Fund and a recent re-investment in this region-specific program.

Notwithstanding these positive changes, Atlantic Canada still faces challenges with respect to R&D. Statistics comparing the most recent data with those found in the Commission's 2000 report show that while Atlantic Canada has seen its R&D expenditures increase, its proportion of these national expenditures has slightly decreased. As was the case in 2000, data also show that for Canada as a whole the business sector is the major source of R&D, but this sector's proportion of expenditures (funding sector—1995=21%, 2002=17%; performing sector—1995=25%, 2002=16%) decreased in Atlantic Canada between 1995 and 2002, largely as a result of the significant increase in higher education investment.[137] Despite the successes of the university system in supporting R&D to the level found elsewhere in the country,[138] a major component of the Innovation Strategy is the private sector and without adequate business sector involvement, the Atlantic region cannot hope to participate in national innovation in the same way as other regions.

Within the federal research funding environment the granting councils are a major component (see Chapter 3). Between 1997-1998 and 2002-2003, Atlantic Canada's granting council income increased substantially, nearly doubling over just five years. Between these same years, Atlantic Canada also maintained its proportion of total granting council funding (6%)—a figure in keeping with its proportion of national graduate enrolments (7%) and population figures (7%) but considerably lower than full-time faculty (12%) or total student enrolment (10%) proportions. Given the heavy reliance on granting council success as the fundamental criterion for accessing the newest federal initiatives, this maintenance of funding levels is important; however, it is also disappointing for those who believed the newest federal initiatives would result in an increased proportion of funding for Atlantic Canada. Analysis of the newest initiatives again confirmed that federal funding is largely dependent on previous granting council success and, as such, limits the potential for smaller universities, of which Atlantic Canada is home to a considerable number, to access new monies. While some modifications to these programs have assisted smaller universities (for example, special allocations within the Canada Research Chairs Program), these adjustments do not overcome the inherent need to have a previous track record in order to gain fully from some of the newest programs.[139]

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[137] In New Brunswick, the decrease in the business sector's proportion of total expenditures, by performing sector, was the result not only of the increase in higher education expenditures but also the decrease (from $42 million in 1995 to $30 million in 2002) in business sector expenditures; for the other Atlantic provinces, business sector expenditures had increased but at a smaller rate of growth than within the higher education sector.

[138] Per capita expenditures, by funding sector, were actually $1 higher for Atlantic Canada ($105) than Canada as a whole ($104) as the Atlantic region experienced a higher rate of growth (124%) than found at the national level (88%)—see Table 2.2, Pg. 24.

[139] In this case, the Indirect Costs program is different from its predecessors as previous granting council funding is used to provide *more* financial support to institutions with the *lowest* levels of granting council funding.

Compounding this difficulty is the prevalence of matching funding requirements. This requirement forces universities to secure partnership investments prior to obtaining access to their awarded funding. However, the provision of matching funding depends on accessibility to provincial government and/or private sector funding, and both these funding sources are limited in Atlantic Canada.

Provincial governments, and the federal government through the AIF, have recently developed mechanisms designed to offset some of the challenges the region faces with respect to enhancing R&D, including investments for matching funding requirements as well as programs designed to foster increased private sector involvement. This is an important advancement since 2000; however, Atlantic Canada remains well behind other provinces and regions in terms of provincial government investment. The programs that are currently in place are also too new to draw conclusions about their overall impact; however, preliminary analysis suggests that provincial governments will face added pressure to increase the amount of money provided as matching funding for federally-based programs.

Despite the significant challenges associated with the Atlantic Innovation Fund (AIF), consultations with senior research administrators in the region's post-secondary community revealed that the recent reinvestment into this program is welcomed by the region's research community. The AIF focus on collaboration has allowed universities (and businesses alike) to obtain considerable research funding not available just five years ago;[140] however, as shown in Chapter 5, there has been some concern over the collaboration process as many more partnerships have been made when non-commercial organizations (of which the majority are universities) are the project lead. Academic researchers have also vented frustration with the ACOA approach to the AIF, and have noted that the business model does not easily transfer to the academic model of doing research. Much work still needs to be done to bring the parties together and to achieve the Fund's goals of enhancing research to build Atlantic Canada's economic capacity.

Springboard Atlantic, the region's research commercialization network, is expected to help in this regard as its primary operators are within the academic community (the Association of Atlantic Universities—AAU). Bridging these two initiatives, the AIF and Springboard Atlantic, is expected to help both the academic community and the private sector to build upon the region-specific attention begun with the AIF.

Preliminary analyses further suggest that specific attention should also be directed toward AIF funding criteria to determine how the AIF can best meet the needs of the region's university system. As the program was intended to provide region-specific funding for the enhancement of Atlantic R&D (and more specifically the commercialization of R&D), and universities are primarily responsible for R&D in Atlantic Canada, consideration of how to maximize university participation in this program would help in meeting regional R&D objectives.

In essence, as illustrated earlier in the report, and reproduced below, Atlantic Canada's R&D environment does not fit the economic model apparent in the Innovation Strategy.

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[140] As noted in Chapter 5, this distribution extends further when examining funding received by universities as project partners, as AIF data are reported only for the project lead. Future data will provide a more accurate picture of the amount of funding received by each university through the Atlantic Innovation Fund.

Salient Features

Federal Innovation Strategy		Atlantic Canada's R&D Environment
Medical-doctoral universities	↔	Primarily undergraduate universities
R&D for commercialization; focus on natural sciences and health	↔	Link to commercialization tenuous; proportionally more R&D expenditures in the social sciences
Large R&D industries (who conduct R&D)	↔	Small to medium size industries (who conduct limited to no R&D)
R&D expenditures in private and public sectors	↔	R&D expenditures in public sector
Universities have the ability to focus more resources on R&D (more graduate programs/enrolments)	↔	Universities have limited resources for R&D (primarily undergraduate)

Despite this disconnect, Atlantic Canada makes important contributions to the nation's post-secondary environment both generally and within the realm of academic research. For example, through its 17 universities, 85,000 student enrolments and more than 3,000 full-time faculty, the region makes important contributions to the education and training of Canada's labour force. These contributions, however, are not fully accounted for if one looks only at research dollars. The following section moves R&D analysis beyond financial data and encourages reflection on post-secondary research at the institutional level and for the region as a whole.

6.3 Reflecting on Post-Secondary Research in Atlantic Canada

Throughout this report, data over and over confirm the intuition that a one-size-fits-all approach is not the most effective way to enhance innovation in a country as diverse as Canada. Atlantic Canada's post-secondary environment is unique, as was observed in Chapter 1. Most of its 17 universities are primarily undergraduate in their focus. Indeed, only three are not primarily undergraduate. To repeat, neither the region's R&D environment nor its constellation of universities fits the national Innovation Strategy.

Despite the region's largely undergraduate focus, universities account for most R&D expenditures by both performing and funding sector in Atlantic Canada. On the other hand, at the national level, although higher education is an important contributor, business enterprise was the major source of R&D expenditures. Atlantic Canada's substantial reliance on university R&D is not new: the Commission's 2000 *Report on Post-Secondary Research Trends in Atlantic Canada* offered the same finding. What is noteworthy is the extent to which this reliance has grown stronger in recent years. In 1995, Atlantic Canada's per capita R&D expenditures in the higher education sector were 15% lower than at the national level; by 2002, these same expenditures had grown 124% and were slightly higher than for Canada as a whole. At the same time, Atlantic Canada's business sector lagged further behind business enterprise at the national level, with the region's per capita funding accounting for 21% of that found at the national level in 1995 and decreasing to 16% in 2002. Given that the region is comprised mostly of primarily undergraduate universities and that a significant portion of R&D activity occurs within the three largest universities (MUN, Dal, UNB), the R&D funding levels achieved in recent years are remarkable.

However, if universities are to continue to be *the* primary R&D sector for the region over the long term (as appears to be the case), stakeholders ought to consider how this role can be maintained alongside other university functions, in particular their role as teaching and learning institutions. Moreover, university mission statements profess a commitment to education that moves beyond the academic and include development of skills in leadership, critical thinking and cooperation as well as instilling in students a sense of shared community, environmental responsibility, and personal and social connectedness. Universities, then, have a role to play not only in discipline-specific learning and research, but also in personal maturation, community development and the creation of social consciousness.

If universities are to be the major R&D performers in the region, and are to continue receiving limited support from other sectors while doing this, it is important to recognize that increased R&D activity and focus will come at a price (indirect costs being a clear example) as other functions are affected. In short, critical reflection on how universities can maintain an effective balance of their core functions, particularly the balance between teaching and research within this context, is warranted.

It is also important to consider that federal government funding programs, while intended to assist universities increase their R&D capacity, appear to be designed primarily with large medical-doctoral universities in mind. While some measures have been taken to offset this challenge (e.g., the Canada Research Chairs and Indirect Costs programs), these efforts do not appear to overcome the two most prominent challenges in federal program design: the requirement of matching funds and funding awards based on previous granting council success.

That is why, at least partially, the Atlantic Innovation Fund was created. The federal government recognized that region-specific funding was needed to assist Atlantic Canada in overcoming some of the challenges faced with respect to R&D and the commercialization of R&D. Nevertheless, the AIF program, however beneficial, does not meet the needs of Atlantic Canada's post-secondary research community because: (1) its funding supply is limited and (2) its business-oriented approach to R&D is not easily applicable to university research. While progress has been made in bringing universities and businesses together within the AIF, this program is not well-suited to meet the region's wide-range of university R&D funding needs. Notwithstanding some of the short-comings of the AIF program, the federal government is a crucial contributor to Atlantic Canada's R&D successes.

Provincial governments have recently implemented programs to assist their respective R&D institutions, including universities. In Atlantic Canada, each provincial government, in varying ways, provides financial assistance for university research. These sources of support include matching funding initiatives, discipline-specific funding (e.g., health-related initiatives) as well as programs designed to foster collaboration among universities and other sectors, particularly industry. However, the investment by Atlantic provincial governments is considerably less and relatively recent in comparison to other Canadian provinces, and preliminary analyses suggest the region's provincial governments will face added pressure to increase investments in university R&D, particularly through matching funds for federally-based programs such as those described in Chapter 4.

Given the region's fiscal constraints, the limited provincial government and private sector R&D participation outlined within the report, and the relatively small size of the region's universities and their sources of internal R&D funding (e.g., endowments, bequests), Atlantic universities should reflect on the future of university R&D, and R&D more generally within the region, to determine how these challenges can be addressed.

Moreover, the national approach to innovation will undoubtedly continue to focus on "big science" and "big health" projects. This approach, however, does not fit with Atlantic Canada's post-secondary composition as even its largest universities often do not have the critical mass or research infrastructure to support such large-scale projects. Consideration of how Atlantic universities, and Atlantic Canada more generally, can make the best possible use of its entire research community is critical.

Although this report focusses on the post-secondary research environment, it is not intended to be a simple update of post-secondary research funding statistics. Instead, it is the hope of the Commission that this report will foster a discussion of the role of universities within the context of economic development so that policy-makers and university stakeholders will begin to reflect upon the future of their post-secondary systems. In doing so, it is paramount that reflection include not only objectives for university research but also objectives for university teaching and other university functions.

Specific questions include issues related to the relative ability and capacity of the region's post-secondary system and how Atlantic universities should fit within the national post-secondary scene. Within the Innovation Strategy, it is apparent that universities, together with business enterprise, are expected to act as economic catalysts for Canada as a whole. In Atlantic Canada, universities are one of the region's strongest R&D sectors and as such are assumed to be well-positioned to engage in R&D that can stir economic growth through commercialization. However, as has been apparent through the statistical analyses in this report, Canada is a diverse country, and universities across Canada do not have equal financial resources, physical infrastructure or critical mass, in short, the conditions required for significant R&D activity. These factors are compounded when one examines university composition by region, and notes that universities in Atlantic Canada as a group are quite different from their national counterparts.

For Atlantic Canada, collaboration between institutions presents significant potential in overcoming some of the challenges with respect to financial resources, physical infrastructure and critical mass. Collaboration is not new in this region. Through projects funded through the AIF, CFI's Innovation Fund and research not explored in detail within this report (e.g., Networks of Centres of Excellence, Genome Canada, etc.), Atlantic universities have made major strides in collaborative research. This type of research appears to be a viable option for building R&D capacity while at the same time alleviating some of the pressures experienced at the institutional level. Through collaboration, Atlantic universities could share both the costs and benefits of R&D and so build R&D capacity, while not being stretched beyond their means.

In addition, given the importance of university R&D and the fiscal constraints they face, provincial governments should consider establishing an on-going dialogue with their universities with a view to establishing strategic partnerships and research networks that would be beneficial not only for collaborating partners but for the region as a whole. Moreover, it is urgent that businesses participate in such collaborative R&D ventures.

Beyond the need for increased interaction among these key players, a collaborative reflection about the role universities ought to play in an economic development agenda focussed on R&D, as well as about the balance that universities need to maintain between teaching and research, must be initiated. To exclude these functions from the reflection on the future of R&D in the post-secondary setting in Atlantic universities may well result in the setting of objectives that put at risk the very strengths that distinguish so many of the region's universities.

Appendix A:
Methodologies

1. Manipulation of Raw Data on Post-Secondary Research Funding

(Funding from the Canada Foundation for Innovation, the Canada Research Chairs program, and the Atlantic Innovation Fund; Sponsored Research Income—Report 3.1 & 2.1A—Canadian Association of University Business Officers)

In an effort to compare like-institutions when analysing post-secondary research funding by province and/or by region (as regional comparisons are made based on provincial-level data), this report utilizes only those universities included in the 2004 edition of the Association of Universities and Colleges of Canada's (AUCC) *Directory of Canadian Universities* (total = 93). Information provided under the auspices of a university listed with the AUCC is attributed to that institution only and does not include any amalgamation, on the part of the MPHEC, with affiliated institutions (for example, University of King's College is examined separately from Dalhousie University in Nova Scotia); however, it should be noted that it is possible that individual universities, funding agencies or other data sources may have reported funding for affiliated institutions within their calculations.

AUCC Universities include:

Newfoundland and Labrador (1)
Memorial University of Newfoundland

Prince Edward Island (1)
University of Prince Edward Island

Nova Scotia (10)
Acadia University
Cape Breton University[142]
Dalhousie University
Mount Saint Vincent University
Nova Scotia Agricultural College
Nova Scotia College of Art and Design University[141]
St. Francis Xavier University
Saint Mary's University
University of King's College
Université Sainte-Anne

New Brunswick (4)
Mount Allison University
University of New Brunswick
Université de Moncton
St. Thomas University

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[141] Formerly the Nova Scotia College of Art and Design.

[142] Formerly the University College of Cape Breton.

Québec (19)

- Bishop's University
- Concordia University
- Hautes Études Commerciales (HEC) Montréal
- Université Laval
- McGill University
- Université de Montréal
- École Polytechnique de Montréal
- Université du Québec
- Université du Québec—École nationale d'administration publique
- Université du Québec—École de technologie supérieure
- Université du Québec—Institut national de la recherche scientifique
- Université du Québec—Télé-université
- Université de Sherbrooke
- Université du Québec à Chicoutimi
- Université du Québec à Montréal
- Université du Québec à Rimouski
- Université du Québec en Abitibi-Témiscamingue
- Université du Québec en Outaouais
- Université du Québec à Trois-Rivières

Ontario (29)

- Brescia University College
- Brock University
- Carleton University
- Collège dominicain de philosophie et de théologie
- University of Guelph
- Huron University College
- King's College
- Lakehead University
- Laurentian University of Sudbury
- McMaster University
- Nipissing University
- University of Ottawa
- Queen's University
- Ryerson University
- Redeemer University College
- Royal Military College
- Saint Paul University
- St. Jerome's University
- University of St. Michael's
- University of Sudbury
- University of Toronto
- Trent University
- University of Trinity College
- Victoria University
- University of Waterloo
- The University of Western Ontario
- Wilfrid Laurier University
- University of Windsor
- York University

Manitoba (4)

- Brandon University
- Collège universitaire de Saint-Boniface
- University of Manitoba
- University of Winnipeg

Saskatchewan (6)

- Campion College
- First Nations University of Canada
- Luther College
- University of Regina
- University of Saskatchewan
- St. Thomas More College

Alberta (7)

- University of Alberta
- Athabasca University
- University of Calgary
- Augustana University College
- Concordia University College of Alberta
- The King's University College
- University of Lethbridge

British Columbia (12)

- The University of British Columbia
- British Columbia Open University
- University College of the Cariboo
- Emily Carr Institute of Art and Design
- University College of the Fraser Valley
- Malaspina University-College
- University of Northern British Columbia
- Okanagan University College
- Royal Roads University
- Simon Fraser University
- Trinity Western University
- University of Victoria

2. Categorization of Universities by Type of Institution

In working to meet the needs of its stakeholders, the MPHEC chose to include data on post-secondary research funding not only by region and/or province but also by university type. Given the high number of primarily undergraduate universities located in Atlantic Canada, the Commission determined that analysis by university type would provide a more detailed picture of post-secondary research funding for this region in comparison to Canada as a whole. As a group, the AAU-MPHEC Advisory Committee on Information and Analysis agreed that the university definitions found in Maclean's magazine should be used for the categorization of universities by type. However, because the report is focussed on the Atlantic provinces, and Maclean's magazine does not include five of the region's public universities within its rankings (because these institutions have "fewer than 1,000 full-time enrolments or a strictly religious or specialized mission"),[143] the Committee chose to incorporate these institutions into the analysis, where applicable. As a result, 52, rather than the 47 universities noted in Maclean's, are classified by university type.

The 52 (47+5) universities by type of institution are:

Medical-Doctoral Universities (15)

- Dalhousie University
- McGill University
- Université de Sherbrooke
- University of Ottawa
- University of Toronto
- University of Manitoba
- University of Alberta
- University of British Columbia
- Université Laval
- Université de Montréal
- McMaster University
- Queen's University
- University of Western Ontario
- University of Saskatchewan
- University of Calgary

Comprehensive Universities (11)

- Memorial University of Newfoundland
- Concordia University
- University of Guelph
- University of Windsor
- University of Regina
- University of Victoria
- University of New Brunswick
- Carleton University
- University of Waterloo
- York University
- Simon Fraser University

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[143] www.macleans.ca/universities/article.jsp?content=20041104_171841_5548

Primarily Undergraduate Universities (21+5)

University of Prince Edward Island
Atlantic School of Theology*
Mount Saint Vincent University
Nova Scotia College of Art and Design University*
Saint Mary's University
Université Sainte-Anne*
Université de Moncton
St. Thomas University
Brock University
Laurentian University
Ryerson University
Wilfrid Laurier University
University of Winnipeg
Acadia University
Cape Breton University
Nova Scotia Agricultural College*
St. Francis Xavier University
University of King's College*
Mount Allison University
Bishop's University
Lakehead University
Nipissing University
Trent University
Brandon University
University of Lethbridge
University of Northern British Columbia

** one of the five Maritime universities added to the analysis but not included in the Maclean's rankings (as a stand-alone university).*

Although the Atlantic School of Theology (AST) offers exclusively graduate-level programs, it is included in the analysis of universities by type as a primarily undergraduate university as it is extremely small and does not fit the definition of a comprehensive university. It should be noted that this university did not receive any sponsored research income in the years examined in this report and as a result, its inclusion does not affect or has a very minimal impact (e.g., it increases the number of universities used in calculations of average) on overall funding results.

3. Manipulation of Raw Data on Post-Secondary Research Funding, University Type

(Funding from the Canada Foundation for Innovation and the Canada Research Chairs program; Sponsored Research Income—Report 3.1—Canadian Association of University Business Officers)

As noted above, data by type of university are restricted to just 52 of Canada's 93 (94 if including the Atlantic School of Theology—AST) AUCC-member institutions. As such, interpretation of data is limited from a regional perspective as proportional representation for each province is not provided; for example, the majority of Québec universities are not included in the categorization while this report adds five Maritime universities excluded from the Maclean's rankings. That being said, analysis by university type does allow universities to gauge where they stand in relation to their peers, as labelled by Maclean's magazine, as data are examined in more detail than is the case with provincial figures alone. For this report, raw data are compiled using the universities listed above (#2) and are examined within the context of the three broad categories of university type rather than university type from province to province or within each province.

4. Canadian Association of University Business Officers (CAUBO) Data

(Sponsored research income from each of the granting councils, provincial governments and Appendix B)

At the beginning of each *Financial Information of Universities and Colleges* report prepared by Statistics Canada for the Canadian Association of University Business Officers (CAUBO), there is a general caveat for all researchers to consider when using data reported. It notes that,

> *Certain data in these reports are subject to interpretation or clarification because of inherent differences among institutions in size, academic programs, organizations, physical environment, management philosophy, and budgetary and accounting procedures. Interregional comparisons must also recognize differences such as various sources of funding, fiscal year-end dates varying from March 31st to June 30th, and different reporting procedures requested by provincial authorities. Comparison of similar reports from previous years should be done with caution due to changes in the* ***Guidelines****, which govern the compilation of these data.*

After acknowledging this general caveat, the AAU-MPHEC Advisory Committee on Information and Analysis determined that CAUBO data were suitable for this report. It is the source of information of at least three of the federal government's newest research initiatives (Canada Research Chairs Program, Canada Foundation for Innovation, Indirect Costs Program) with regard to previous granting council success and offers parallel data for the government's key programs. These data, in combination with information from other sources (e.g., university groupings, enrolment and faculty statistics), are used in several chapters of the report and are the source of information found in Appendix B .

5. Inconsistent Reporting Periods

(Fiscal year versus calendar year)

Where calculation of data involves two different reporting periods (one using fiscal year, the other using calendar year), the first year of the two-year fiscal period is used to calculate funding. In computing per capita data, for example, the first year of the fiscal year is used as population data are provided as of July for the calendar year and are meant to be used as a "snapshot" of the population at a particular time.

6. Constant Dollars

(Research funding reported in a series to show trends over time)

Unless otherwise indicated, reported dollars have been converted to constant dollars to account for the effects of inflation. In Chapter 4, data are not converted to constant dollars as funding amounts were reported as a total and not by year awarded.

In calculating constant dollars, the report used information from the Bank of Canada's Inflation Calculator (www.bankofcanada/en/inflation_calc.htm) downloaded in March 2004. To ensure consistency throughout the report, the March 2004 figures are used in all cases to represent the change in dollar value to meet 2004 levels. The following is an example of how constant dollars have been calculated.

Example:
1992 = $1,000,000 in research funding; 2004 = $1,000,000 in research funding.

1992 value in 2004 terms → $1,000,000 x .2419 = 241,900
$1,000,000 - 241,900 = $758,100

$1,000,000 received in 1992 has a value of $758,000 in 2004; therefore, in the time series, its calculated value is $758,000.

For each year between 1992 (the furthest year included in the report) and 2003 (the last year requiring manipulation to constant dollars) the following percentages were used:

1992 = 24.19%
1993 = 21.38%
1994 = 21.14%
1995 = 18.92%
1996 = 17.45%
1997 = 14.93%
1998 = 13.76%
1999 = 12.92%
2000 = 10.00%
2001 = 6.94%
2002 = 5.39%
2003 = 0.74%

7. Enrolment Data

Prior to implementation of the Enhanced Student Information System (ESIS), Statistics Canada had used survey specific specialization or major field of study coding structures called the University Student Information System (USIS), the Community College Student Information System (CCSIS) and the Trade and Vocational Student Survey (TVOC) in the generation of data by field of study or major subject taught. Since the implementation of ESIS, program information is coded using the new Classification of Instructional Programs (CIP) so as to augment the comparability of Canadian and American data. Review of the adapted CIP codes is currently underway with the same classification system expected to be phased in for other Statistics Canada surveys over the next several years (2002-2007).

In 2003, Statistics Canada published its first rendition of enrolment data, as of 2001-2002, using CIP enrolment codes. More recent data have yet to be released. For the purposes of this report, CIP data are not yet conducive to category groupings under the three larger heading of natural sciences and engineering, social sciences and humanities, and health (described further under point #8) as further mapping is required to ensure definition consistency for program offerings across Canada.

Within data prior to 2000-2001 (and ESIS data at the Maritime level), enrolment figures were reported using the specialization or major field of study codes found in current faculty data (with CIP codes to be generated alongside these codes over the next few years), which are structured according to the specialization or major field of subject taught. As a result, the MPHEC opted to include enrolment data for the latest year available according to these codes (2000-2001) when examining the distribution of enrolments by discipline across Canada. Enrolments by level are provided for the following year (2001-2002) as these are the latest available as of Spring 2005.

8. Categorization of Disciplines to Coincide with Granting Councils

(Faculty data, enrolment data)

Using the categories employed under the University and College Academic Staff Survey (UCASS) for faculty data, and Statistics Canada's field of study (FOS) categories prior to conversion to CIP coding, data were combined to create three broad groups of disciplines: natural sciences and engineering, social sciences and humanities, and health. These groups of disciplines were developed with the intent of corresponding, to the extent possible, with areas of research that would likely fall under the realm of one of the three granting councils, the Natural Sciences and Engineering Research Council (NSERC), the Social Sciences and Humanities Research Council (SSHRC) and the Canadian Institutes of Health Research (CIHR). Included in these discipline groupings are:

Natural Sciences and Engineering
  Agricultural and Biological Sciences
  Engineering and Applied Sciences
  Mathematics and Physical Sciences

Social Sciences and Humanities

- Education, Physical Education, Recreation and Leisure
- Fine and Applied Arts
- Humanities and Related
- Social Sciences and Related
- Commerce and Administration (in Maritime-level data; in national data these are already combined with the Social Sciences and Related category)

Health

- Health Professions and Occupations

It is important to note that faculty and enrolment figures that were not identified by discipline ("Not Reported/Not Applicable") or were reported in a field of study that could fit into more than one of these three categories ("Arts and Science—General") are kept separate in the analyses.

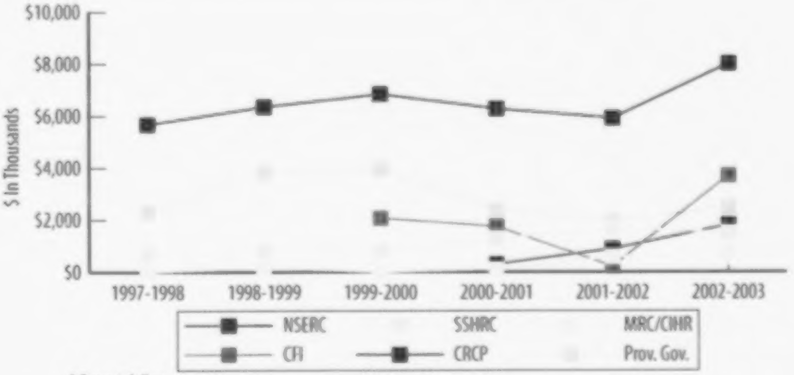
Appendix B:

Selected Sponsored Research Funding Statistics, by Atlantic Province[144] and University, 1997-1998 to 2002-2003

Legend:

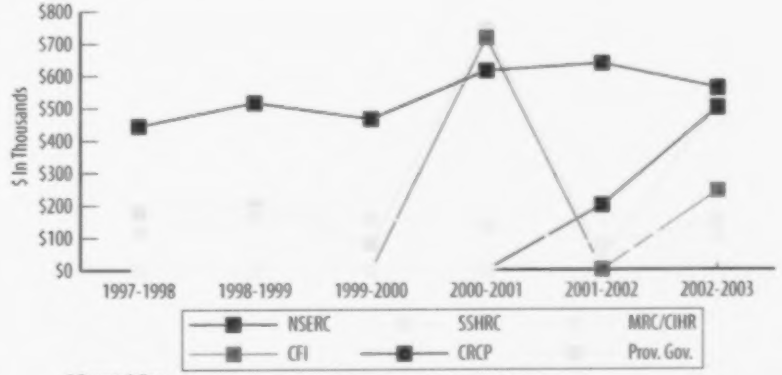
NSERC = Natural Sciences and Engineering Council
SSHRC = Social Sciences and Humanities Research Council
MRC/CIHR = Medical Research Council or the Canadian Institutes of Health Research
CFI = Canada Foundation for Innovation
CRCP = Canada Research Chairs Program
Prov. Gov. = Provincial Government

New Brunswick Provincial Totals ($000)



* Current dollars.
Source: CAUBO, Respective Years, Report 2.1A.

Mount Allison University (MTA) ($000)



* Current dollars.
Source: CAUBO, Respective Years, Report 3.1.

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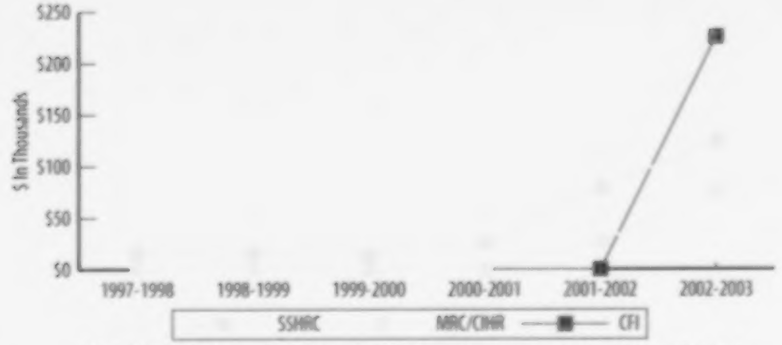
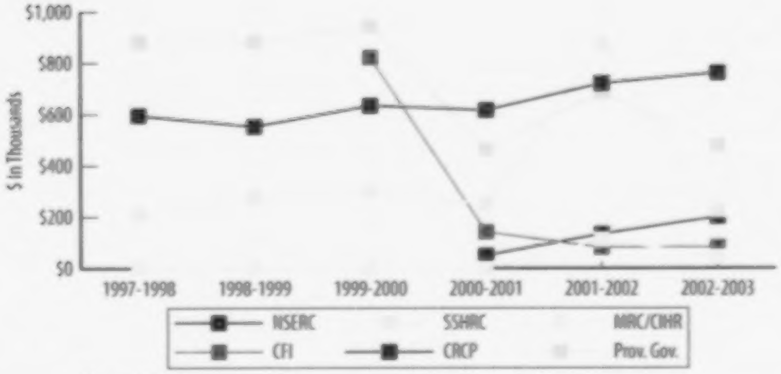
[144] Only one university is located in both Newfoundland and Labrador (MUN) and Prince Edward Island (UPEI); as such, university-level data also represents provincial-level data for these two provinces.

St Thomas University (STU) ($000)



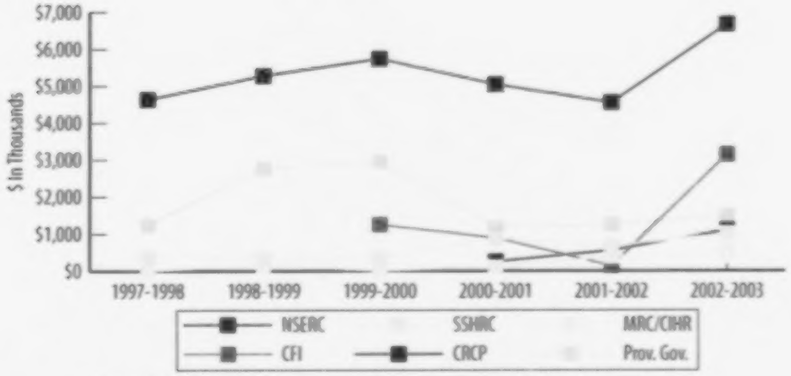
* Current dollars; STU did not receive sponsored research income from the other three sources during this period.
Source: CAUBO, respective years, Report 3.1

Université de Moncton (UdeM) ($000)



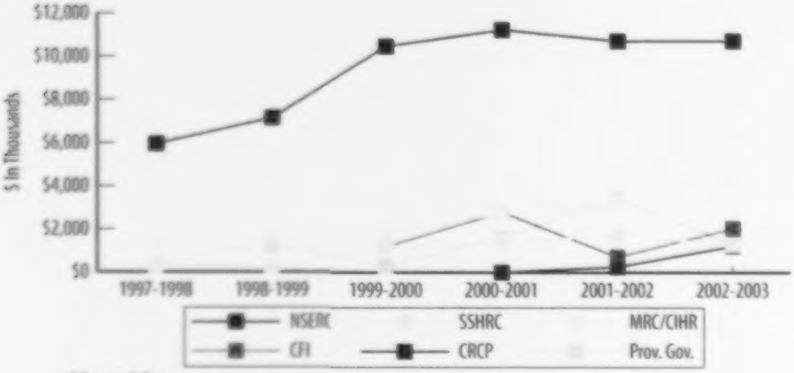
* Current dollars.
Source: CAUBO, Respective Years, Report 3.1.

University of New Brunswick (UNB) ($000)



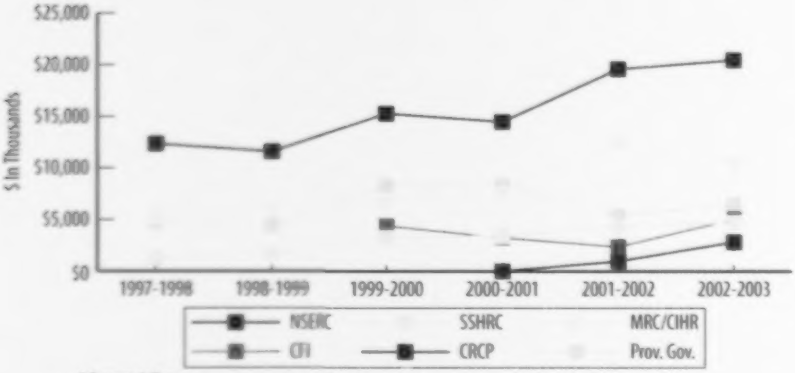
* Current dollars.
Source: CAUBO, Respective Years, Report 3.1.

Memorial University of Newfoundland (MUN) ($000)



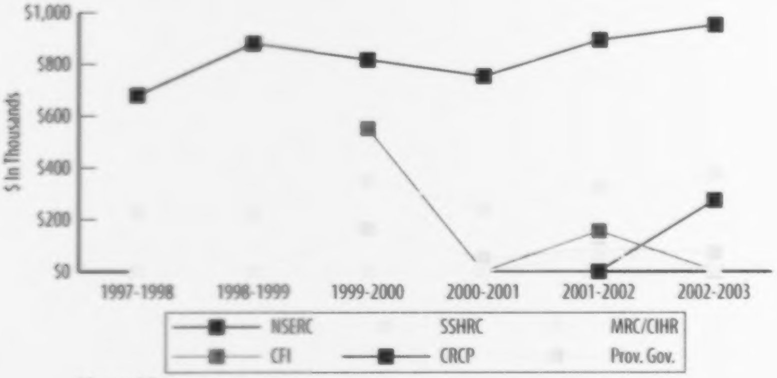
* Current dollars.
Source: CAUBO, Respective Years, Report 3.1.

Nova Scotia Provincial Totals ($000)



* Current dollars.
Source: CAUBO, Respective Years, Report 2.1A.

Acadia University (ACAD) ($000)

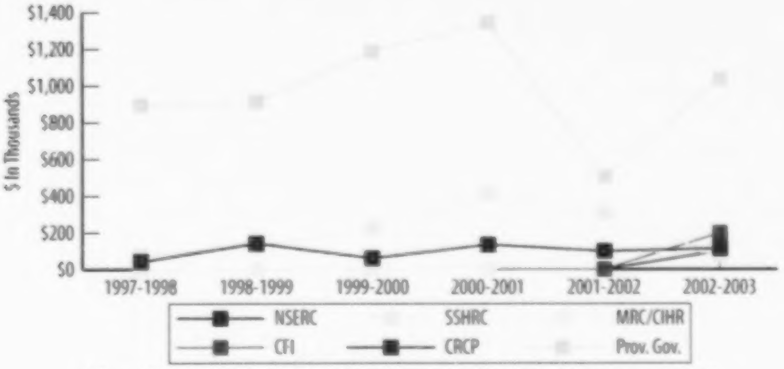


* Current dollars.
Source: CAUBO, Respective Years, Report 3.1.

Atlantic School of Theology (AST)

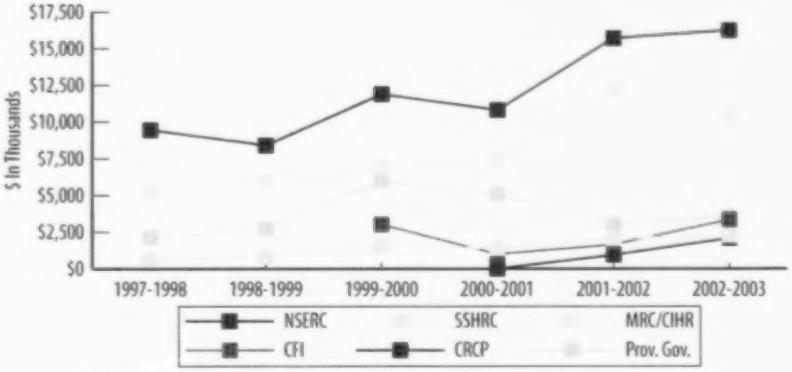
According to CAUBO data, the Atlantic School of Theology (AST—www.astheology.ns.ca) did not receive any sponsored research income during the period.

Cape Breton University (CBU) ($000)



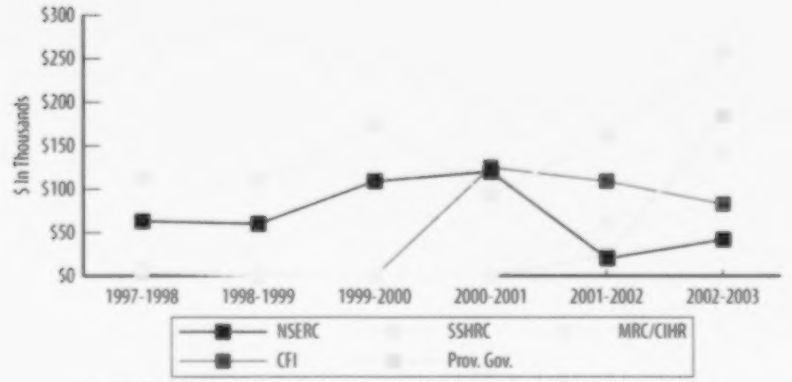
* Current dollars; in 2005, the University College of Cape Breton changed its name to Cape Breton University, in the data the former name would be used.
Source: CAUBO, Respective Years, Report 3.1.

Dalhousie University (DAL) ($000)



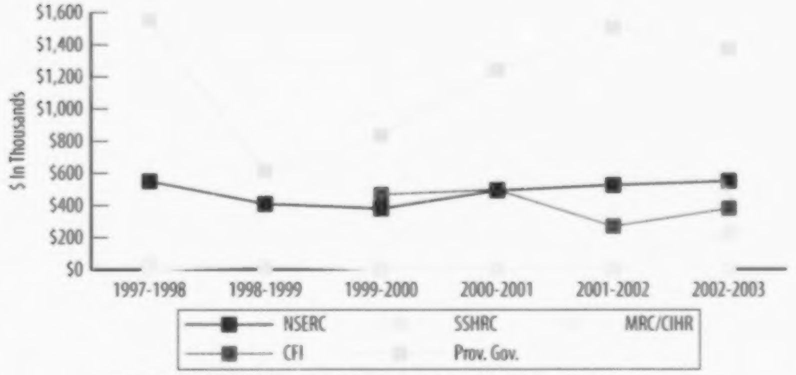
* Current dollars.
Source: CAUBO, Respective Years, Report 3.1.

Mount Saint Vincent University (MSVU) ($000)



* Current dollars; MSVU did not receive funding through the CRCP during this period.
Source: CAUBO, Respective Years, Report 3.1.

Nova Scotia Agricultural College (NSAC) ($000)

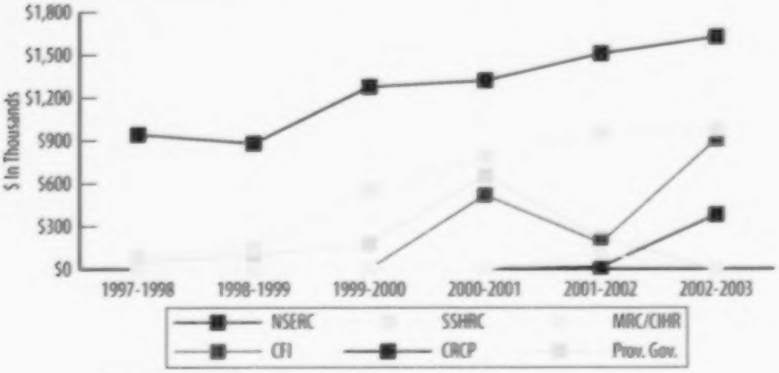


* Current dollars; NSAC did not receive funding through the CRCP during this period.
Source: CAUBO, Respective Years, Report 3.1.

Nova Scotia College of Art and Design University (NSCAD)

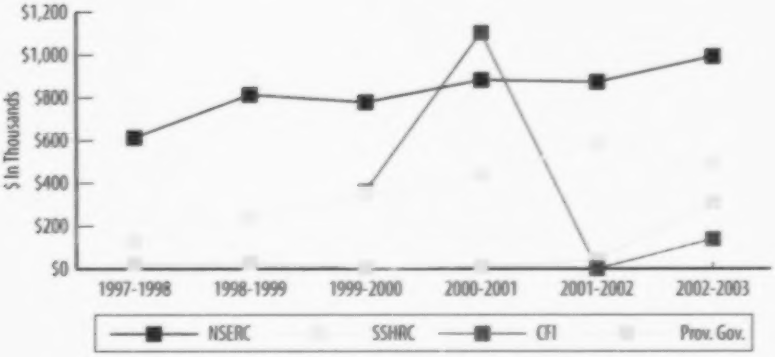
The Nova Scotia College of Art and Design changed its name to Nova Scotia College of Art and Design University (NSCAD) in 2003; therefore, in the data the institution would be referred to by its former name. Between 1997–1998 and 2002–2003, NSCAD received sponsored research income from two sources: Prov. Gov. $16,000 in 1997–1998 and SSHRC $6,000 in 2000–2001.

St. Francis Xavier University (SFXU) ($000)



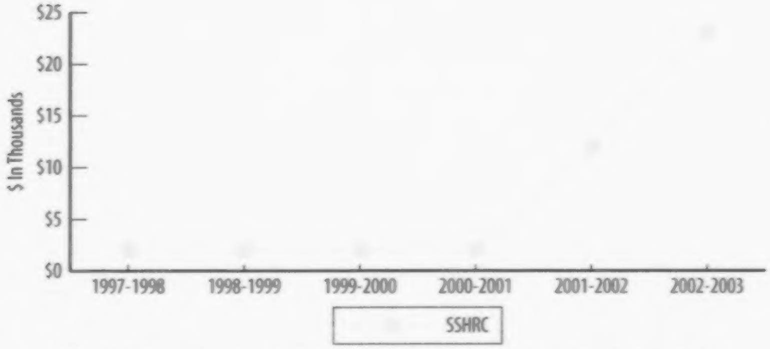
* Current dollars.
Source: CAUBO, Respective Years, Report 3.1.

St. Mary's University (SMU) ($000)



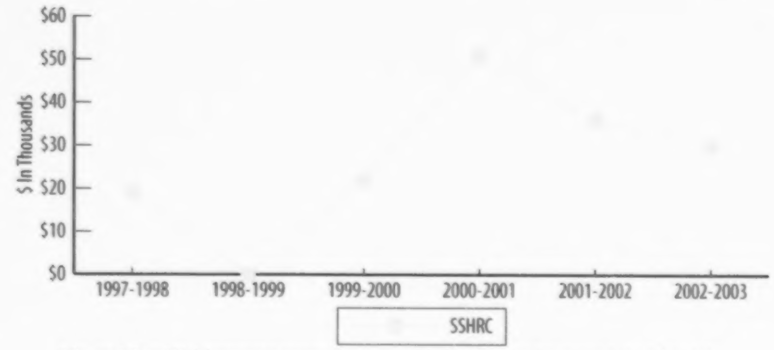
* Current dollars; SMU did not receive sponsored research income from the MRC/CIHR or the CRCP during this period.
Source: CAUBO, respective years, Report 3.1

University of King's College (UKC) ($000)



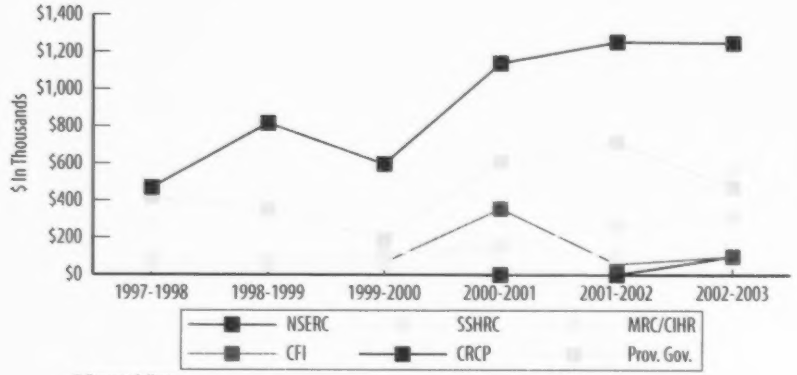
* Current dollars; UKC did not receive sponsored research income from the other five sources during this period.
Source: CAUBO, respective years, Report 3.1

Université Sainte-Anne (USA) ($000)



* Current dollars; USA did not receive sponsored research income from the other five sources during this period.
Source: CAUBO, respective years, Report 3.1.

University of Prince Edward Island (UPEI) ($000)



* Current dollars.
Source: CAUBO, Respective Years, Report 3.1.

Appendix C:

Collaborative Atlantic Research Projects

AIF Collaborative Projects

The Centre for Marine Compressed Natural Gas
Lead Proponent: Memorial University of Newfoundland (MUN)

Memorial University's Centre for Marine Compressed Natural Gas (CNG) will be the world's first CNG marine transport testing facility. This technology is especially targeted at natural gas resources considered as "stranded" (i.e., there is no existing transportation system). The Centre will establish a large-scale, dynamic testing facility, engage industry and international research institutes in collaborative R&D to meet industry-wide needs, and provide clients with open access for all CNG-related technology development, testing and related R&D contract services. The CNG Testing Facility will focus on applied technology development of gas handling systems, environmental and safety systems, export gas properties testing, vessel model testing and vessel logistics simulation. R&D expertise from Memorial in collaboration with industry partners will work on technical solutions to commercialize the development of marine transportation of compressed natural gas.

The Centre has many collaborating partners who have purchased membership including the following groups: Enersea Canada; The Gas Technology Institute (US); BMT (British Marine Technology) Fleet Technology Limited; Canship Ugland; Enbridge Inc.; Bluewater Offshore Production Systems (USA) Inc.; BJ Process and Pipeline Services; Norsk Hydro Canada Oil and Gas, Inc.; Williams Energy Marketing and Trading Company; BP Exploration; Emera Energy; Maritimes and Northeast Pipeline; Kawasaki Kisen Kaisha, Ltd. (K-Line); BMT Fluid Mechanics Ltd. (UK); and ABB AS (Norway). They also have memberships from the following international regulatory bodies: American Bureau of Shipping; DNV Ship Classification (Europe); American Society of Mechanical Engineers; United States Coast Guard; Lloyds Insurance; and Canada Newfoundland Offshore Petroleum Board.

The Centre held the first International Marine CNG Standards Forum in St. John's in 2004 with a follow-up forum planned for August, 2005. The Centre has become a focal point for industry to address regulatory and R&D issues as illustrated by the success of this forum and the broad representation from CNG proponents, ship classification societies, regulators, shipping companies, and other industry interests. Its challenge is to balance the specific interests of CNG proponents and others with the interests of an industry-wide R&D facility.

The Centre expects to complete the construction of the testing facility by the end of 2005. The total costs of the project will be $8,053,001 and the AIF contribution will be $3,994,042.

Atlantic Canada Network for Bioactive Compounds
Lead Proponent: University of Prince Edward Island (UPEI)

For the last several years, the Faculty of Science at the University of Prince Edward Island (UPEI) has been actively involved in the research and development of nutraceutical products from various plant materials. The Atlantic Canada Network on Bioactive Compounds is researching and analyzing bioactive compounds extracted from roses (rose hips) and blueberries, which show great commercial potential. Research and development on bioactive compounds in these two areas is generating and enhancing partnerships among universities, the private sector and government research institutions.

This project will investigate and profile the chemical, bioactivity and antioxidant activity of various bioactive compounds in wild blueberries and Atlantic wild roses. To accomplish this, UPEI will develop and optimize post harvest extraction and processing technologies to stabilize and enhance the yield of the desired bioactive compounds such as antioxidants used in a variety of health products such as teas, health foods and supplements. As well, the efficacy and safety of these active compounds in enhancing health or treating illnesses will be investigated.

The "Atlantic Canada Network on Bioactive Compounds," together with the PEI Food Technology Centre's "Atlantic Natural Products Initiative" and other partners, will enable the industry in Atlantic Canada to overcome its current dependency on outsourcing research and technical services throughout North America. This will allow Atlantic Canada to establish a full continuum of technical and testing capabilities essential to commercialize bioactive products and to further utilize and explore the potential uses of other PEI bio-resources.

This project is expected to generate eight full-time R&D positions and develop 11 new technological disclosures, products and/or processes that will involve various private/public sector partners. This project with total project costs of over $4,357,118 will receive $2,700,000 from the Atlantic Innovation Fund over a five-year period with additional financing from other private and public sources.

Materials Technology Network (MatNet)
Lead Proponent: Dalhousie University (Dal)

With the support of the Atlantic Innovation Fund (AIF), the Canada Foundation for Innovation (CFI) and the Natural Sciences and Engineering Research Council (NSERC), Dalhousie University, together with its university and private sector partners, is creating a network of world-class materials research capability in Atlantic Canada. The Materials Technology Network for Atlantic Canada (MatNet) involves five Atlantic universities and 12 private companies which are undertaking research projects to address a broad range of new technologies within three themes: Energy and Communication Technologies, Technologies to Monitor and Improve Material Performance, and Smart/Responsive Materials.

The research program addresses significant and exciting technologies, from smart materials and systems for monitoring public buildings and highways, through corrosion-resistant materials for harsh marine environments, to development of new materials for information and energy technologies. Assistance for this $15.9 million project is provided in part by AIF ($6.4 million), CFI ($3.7 million) and NSERC ($1.5 million). Additional financing for the project has been provided by other public sector and commercial partners involved with the project.

MatNet brings together a number of Atlantic Canadian organizations that share an excitement about materials research and its power for change. These partners will not only assist the project financially, but will also provide expertise in specific materials-related sectors from which the entire project can benefit. Furthermore, the private sector partners will also provide an excellent opportunity for the future commercialization of the results of MatNet's research. MatNet's partners include: outstanding researchers from five Atlantic Canadian universities (Acadia University, Dalhousie University, Memorial University of Newfoundland, University of New Brunswick, University of Prince Edward Island); key materials-dependent Atlantic industries (Composites Atlantic Limited, ECI Medical Technologies Inc., G. N. Plastics Company Limited, Hi Tech Wood Products, Intertape Polymer Corp., Nova Crystals Ltd., Sable Offshore Energy Inc., Sepracor Canada Ltd., and The Shaw Group Limited), as well as the Petroleum Research Atlantic Canada, Defence Research and Development Canada—Atlantic, 3M Canada Company, Canada Foundation for Innovation, the Natural Sciences and Engineering Research Council, the National Networks of Centres of Excellence and the Canada Research Chairs Program.

Novel Bioreactor for Wastewater Treatment

University of New Brunswick (UNB)

The Water and Environmental Engineering research group in the Department of Civil Engineering at UNB consists of faculty with expertise in wastewater and water treatment, groundwater quality, surface water quality, and water supply. This group has been successful in attracting research grants and establishing collaborations with industries, research institutes, municipalities, government organizations and other universities in the region.

Under the leadership of Dr. Kripa Singh, this AIF-funded project proposes to research and develop a new and innovative biological wastewater treatment process for the treatment of biodegradable industrial wastewaters. The new High Rate Activated Sludge (HRAS) process uses several new concepts in industrial wastewater treatment and will have many competitive advantages over existing technologies, including significantly less reactive volume, a smaller plant footprint, less aeration energy consumption, less sludge production, nitrogen removal in a single step with less aeration, superior effluent quality when combined with state-of-the-art submerged membrane clarification technology, and superior economics (lower capital and operating costs). Lab research will establish design principles for pilot and full-scale systems. A pilot system will refine the process by treating real-time wastewater at a french fry plant in Prince Edward Island (PEI).

ADI Systems Inc. (ADI), an engineering and industrial wastewater systems technology company based in Fredericton, NB, will serve as industrial partner in the project, providing technical guidance and direction to the research and development effort, as well as serving to commercialize, market, design and sell the technology. ADI is a wholly owned subsidiary of ADI Group Inc., a Fredericton-based, employee-owned engineering consulting firm that was created by a group of UNB engineering professors in 1945. It now employs more than 200 people and has branch offices throughout the Maritimes. ADI has installed over 130 industrial wastewater treatment systems in North America, the Caribbean, Mexico, South America, Europe, India, Australia, China, and Southeast Asia. A french fry plant in PEI is also a partner in carrying out the project offering full access to its plant and existing waster treatment system.

The project, with total costs of $1,289,711, will receive $602,601 from the Atlantic Innovation Fund over a five-year period. Other funding sources include ADI ($100,944 cash and $124,647 non-cash in the form of access to equipment and expertise); NSERC ($40, 594); CFI ($84,444); NBIF ($52,331) and UNB ($284,170).

CFI Innovation Fund Projects

The following paragraphs briefly describe three of the region's most recent (Date of Final Decision: March 2004), and highest funded, projects supported by the CFI's Innovation Fund.

Atlantic Computational Excellence Network (ACEnet)

Lead Institution: Memorial University of Newfoundland

The largest CFI-funded project in Atlantic Canada's university system, as of April 2004, is led by Memorial University of Newfoundland and includes 6 partnering universities: University of Prince Edward Island, Dalhousie University, St. Francis Xavier University, Saint Mary's University, Mount Allison University and the University of New Brunswick. ACEnet, the Atlantic Computational Excellence Network, is a high performance computing (HPC) infrastructure that allows researchers to perform high-power computing specific to their area of research. One of only 6 in Canada, ACEnet's HPC facilities will be "interconnected by high speed networks allowing them to behave as a single, regionally distributed 'computational power grid' of enormous capacity. ACEnet will also create and operate sophisticated video-teleconferencing facilities to bind together our geographically dispersed research communities."[145]

Through a $9.9 million investment from the CFI's Innovation Fund, ACEnet is projected to be worth nearly $28 million (including $3 million from the CFI's Infrastructure Operating Fund) upon finalization of provincial and private sector contributions. In addition to the direct advantages of this large scale project, ACEnet will be valuable to the region as a leveraging agent by providing the means to attract and retain the best faculty and students, as well as private sector partners, who would otherwise have gone outside the region for this type of research capability.

As a project exhibiting regional collaboration in its development, ACEnet proposes to further encourage region-wide collaboration through the establishment of several ACEnet Institutes[146] founded around research themes such as computational chemistry, material physics, and computer science. For example, at Saint Mary's University in Nova Scotia, ACEnet is allowing researchers to model the internal structure of stars, pushing them to the forefront of international astrophysics and astronomy.

Through advances such as ACEnet, and investments like those found under the CFI's Innovation Fund, researchers at Atlantic Canada's universities are making significant contributions to Canadian R&D. For more information on ACEnet visit www.ace-net.ca to browse through project descriptions and to obtain a copy of the ACEnet newsletter, *Making Waves.*

Canadian Centre for Vaccinology

Lead Insitution: Dalhousie University; Partner Institution: IWK Health Centre

The Canadian Centre for Vaccinology (Halifax), in Dalhousie University and the IWK Health Centre, Halifax, Nova Scotia, was established to develop, implement, and evaluate vaccine technologies and vaccines for infectious diseases that have a significant impact on Canadian and global health and to train experts in these critical and evolving fields. This integrated, multidisciplinary research program brings together investigators from diverse disciplines to focus on vaccine discovery and evaluation. The collaboration of researchers in basic biomedical, clinical, and social sciences and the humanities provides a continuum of vaccine research from basic microbiological and molecular research in vaccine discovery and development, to translational research-research that takes basic science to marketable product-such as vaccine safety and efficacy studies, to evaluation research, encompassing clinical trials as well as vaccine program and policy evaluation. Social sciences and humanities research is integrated with both vaccine discovery and evaluation; it addresses a wide range of ethical, legal, and societal issues that inform policy and practice.

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[145] www.cvc.mun.ca/~acenet.

[146] The four "host institutions" are MUN, UNB, SMU, and SFXU with additional institutes organized as need arises.

Infrastructure funding awarded by the Canada Foundation for Innovation to Dalhousie University and the IWK Health Centre to establish the Centre will enable the investigators and their trainees to be housed under one roof and to benefit from the synergies forged by close collaboration and on-site interaction. The facilities will include laboratories for microbiological and molecular research, a Containment Level 3 laboratory, ambulatory clinical trial facilities and a human vaccine challenge unit, and data analysis, training, and videoconferencing/telemedicine capabilities.

The Centre will serve as an "academic pipeline" for Canadian vaccine priorities identified through the National Immunization Strategy. It will facilitate public health policy development by enabling policy makers and planners to obtain scientific data upon which to base their decisions and evaluate the outcomes of implemented policies. The Canadian Centre for Vaccinology in Halifax, together with other vaccine centres elsewhere in Canada such as in British Columbia (Vaccine Evaluation Center and the BC Centre for Disease Control, Vancouver), Saskatchewan (Vaccine and Infectious Disease Organization, Saskatoon), and Québec (McGill University, Montreal, and Institut national de santé publique du Québec, Québec City), will form a nationwide network for collaborative and complementary vaccine research. The establishment of the Centre is expected to strengthen existing ties and foster new collaborative efforts on both national and international levels. The Centre will house a human vaccine challenge unit that is the first of its kind in Canada and, with less than a dozen such facilities worldwide, at the cutting edge of global vaccine research.

The CFI Innovation Fund award of $2.26 million was matched by $2.26 million from the Government of Nova Scotia Office of Economic Development and $1.13 million from the IWK Health Centre and other partners, for a total project funding of $5.64 million. The IWK Health Centre was also eligible to apply for additional funding for this project through the CFI Research Hospital Fund and was subsequently awarded $2.18 million to expand and enhance the Canadian Centre for Vaccinology.

Canadian Rivers Institute (CRI)

Lead Institution: University of New Brunswick

The Canadian Rivers Institute (CRI) was established as a bi-campus institute (Saint John and Fredericton) at University New Brunswick (UNB) in 2001, and was expanded shortly thereafter to include additional partners, including the Watershed Research Group at University of Prince Edward Island (UPEI). It is a multi-university, multi-sector institute focused on protecting the ecological health of Canadian rivers, including their estuaries, and is a key component of UNB's and UPEI's strategic plans for establishing leadership in cooperative research networks.

Development of CRI infrastructure, through expansion of the facilities at the University of New Brunswick Saint John campus (UNBSJ) and University of Prince Edward Island (UPEI), will support research initiatives in the areas of aquatic environmental research and environmental technologies. This expansion includes establishing new facilities for understanding the ecological health of rivers and estuaries and will support unique Canadian "state-of-the-science" research in aquatic sciences.

More specifically, through funding provided by the CFI, the Atlantic Canada Opportunities Agency (ACOA) and the Province of New Brunswick, the new CRI infrastructure will house an expanding program that focuses on identifying, mitigating and managing aquatic impacts of the region's primary resource industries (forestry, pulp and paper, mining, aquaculture, and agriculture). The proposed facilities will be unique to academic institutions of the region and will serve as a basis for enhanced inter-university and external research. When completed, no other integrated facility for undertaking field, mesocosm, and laboratory ecotoxicology studies will exist at this internationally-competitive level anywhere in Canada. As of 2004, development of the CRI has resulted in the addition of three Canada Research Chairs, three new faculty positions, two visiting faculty positions, four funded technical appointments and a variety of soft-money positions. The CRI also continues to expand through the creation of Research Fellows and Associates and through the development of collaborative agreements, which allow for the transfer of personnel from government to Atlantic Canadian universities such as UNB and Acadia University.

Total funding for this project amounts to approximately $5 million with CFI contributions accounting for approximately $1.8 million. The Atlantic Canada Opportunities Agency (ACOA) and the Province of New Brunswick are also major contributors with approximately $1.6 million invested through ACOA's Business Development Program and another $1.5 million provided by the Province through its University Infrastructure Trust Fund.

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